

CTL EPITOPES

How to Use Part I:

Section 1: HIV CTL Epitope Tables, Maps, Variability Plots, and Alignments by Protein

This section summarizes HIV-specific CTL epitopes arranged sequentially according to their location on the genome, organized by protein. We attempted to make this section as comprehensive as possible, requiring that the epitope be contained within a region of 30 or so amino acids, but not that the precise boundaries be defined. The HLA specificity of the epitope may or may not have been defined. For a table of the best characterized CTL epitopes that have precisely defined boundaries of 8-10 amino acids, with known associated HLA molecules, please see the review by Christian Brander and Bruce Walker in Section IV: *The HLA-class I restricted CTL response in HIV-1 infection.*

TABLES: each CTL epitope has a five part basic entry:

- **Location:** The amino acid positions of the epitope boundaries and the reference sequence are listed as given in the primary publication. Frequently, these positions as published are imprecise, and do not truly correspond to the numbering of the sequence, but they provide a reasonable guide to the peptide's approximate location in the protein. Also, in many cases the reference sequence identification was not provided.
- **Epitope:** The amino acid sequence of the epitope of interest as defined in the reference, based on the reference strain used in the study defining the epitope. On rare occasions, when only the epitope location and not the actual epitope was specified in the original publication, and the sequences were numbered inaccurately by the primary authors, we may have misrepresented the epitope's amino acid sequence.
- **Antigen:** The immunogen that stimulated the CTL response.
- **Species(HLA):** The species responding and HLA specificity of the epitope.
- **Reference**

HIV CTL Epitopes

Following each entry for a given CTL epitope is a brief comment explaining the context of the study that defined the epitope.

MAP:

The location and HLA restriction elements of CTL epitopes are indicated on protein sequences of the WEAU clone 1.60. This map is meant to provide the relative location of epitopes on a given protein, but the WEAU sequence may not actually carry the epitope of interest, as it may vary relative to the sequence for which the epitope was defined. Epitope regions are numbered, and the numbering on this map is used for the variability plots and the epitope alignments.

WEAU was chosen as the reference clone because it is one of the best characterized sequences currently available; the sequence was graciously provided prior to publication by George Shaw, and the manuscript describing the clone and sequence is in preparation. The clone was obtained from a co-culture of this patient's PBMC's, first with normal donor PHA-stimulated lymphocytes for 14 days, and then with the H9 T-cell line for another 14 days. The blood specimen was obtained 15 days after the onset of clinical symptoms of acute (primary) infection, and 35 days after a single sexual encounter (receptive anal intercourse) with a partner whose virus was proven phylogenetically to be responsible for the transmission event. The single nucleotide deletion in nef in the WEAU 1.60 clone is NOT present in the patient's uncultured PBMCs where instead there is a "T." Thus, in the clone WEAU 1.60 nef is disrupted, but in the patient, the virus contains an intact nef gene in 10 out of 10 clones analyzed by PCR sequencing. The patient from whom WEAU 1.60 was derived is identified a "Patient #1" in N Engl J Med 324:954-960, 1991 and as "WEAU 0575" in Science 259:1749-1754, 1993. WEAU 1.60 and the virus isolate from which it was derived are SI (syncytium-inducing) strains. The full-length WEAU 1.60 provirus has been sequenced in its entirety by two different laboratories (G. Shaw and L. Hood) with 100% concordance.

VARIABILITY PLOTS:

The Shannon entropy for each column in the alignment is plotted for each position in the alignment (Korber et al., J. Virol. 68:7467-7481 1994). The entropy for perfectly conserved positions is zero, and higher numbers indicate relatively greater variability. Alignments of available full length (across a given protein) M group HIV-1 sequences from the 1995 HIV-1 sequence database were used as a basis to calculate the entropy for each po-

sition. The entropy scores can not be compared between different proteins, because the alignments consisted of different sets of sequences, and thus are not equivalent. The protein variability plots are internally consistent for a given protein, however, and thus provide an indication of the level of variability found in the region of a given epitope. The numbering of the epitopes corresponds to the epitope map.

ALIGNMENTS:

Following the numbering of the epitopes in the epitope map, alignments were generated from the protein sequence alignments in the HIV-1 genetic sequence database. All epitopes are aligned to the subtype B consensus (the most common amino acid found in subtype B in each position), with the sequence used to define the epitope indicated directly beneath the B consensus. We used the 1995 HIV-1 database alignments for this section, although as the databases were being completed concurrently, the sequence compendium may have some additional sequences that were not in place when this section of the immunology database was generated. The sequence database alignments were modified if there were multiple insertions made to maintain the alignment across the epitope, in an attempt to optimize the alignment across the epitope and minimize insertions and deletions. A dash indicates identity, and a period indicates an insertion made to maintain the alignment. Epitopes with stop codons, frameshifts, or partial sequence were deleted. The consensus sequences for a subtype may not exactly reflect the sequences shown, as the consensus sequences were generated prior to the deletion of the problematic epitope sequences.

Section 2: Table of HIV CTL Epitopes Sorted by HLA Restricting Elements

This section is a table of the epitopes included in Section 1 that have known HLA restricting elements, sorted by the restricting element. Anchor and auxiliary residues for HLA molecules are listed, and if anchor residues with appropriate spacing are evident in the epitope, they are indicated by being written bold and underlined. This table provides minimal information about the epitopes; for more information see the table where epitopes are organized by location.

Section 3: References

HIV CTL Epitopes

**I-4
NOV 95**

p17 CTL Epitopes

CTL p17 Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
p17(18-42 IIIB)	KIRLRPGGKKKYKLKHIVWASRELE Epitope recognized by CTL clone derived from CSF	HIV-1 infection	human(A3)	[Jassoy (1992)]
p17(18-42 BH10)	KIRLRPGGKKKYKLKHIVWASRELE Gag CTL response studied in three individuals; epitopes mapped by peptide competition	HIV-1 infection	human(Bw62)	[Johnson (1991)]
p17(18-42 PV22)	KIRLRPGGKKKYKLKHIVWASRELE HIV-1 specific CTLs release γ -IFN, and α - and β -TNF	HIV-1 infection	human(A3)	[Jassoy (1993)]
p17(18-26 LAI)	KIRLRPGGK Unpublished, T. Harrer; defined by A3.1 motif found within a larger peptide in		human(A3.1)	[Brander & Walker(1995)]
p17(20-29)	RLRPGGGKKKY Unpublished, C. Jassoy		human(A3.1)	[Brander & Walker(1995)]
p17(20-29 LAI)	RLRPGGKKKY Review of HIV CTL epitopes; defined as minimal peptide by titration curve		human(Bw62)	[McMichael & Walker(1994)]
p17(21-35)	LRPGGKKKYKLKHIV Two CTL epitopes defined		human(B8)	[Nixon & McMicheal(1991)]
p17(24-32 LAI)	GGKKKYKLK Exploration of HLA B8 binding motif through peptide elution; this peptide was studied in detail	HIV-1 infection	human(B8)	[Sutton (1993)]
p17(24-32 LAI)	GGKKKYKLK Study of an individual with partially defective antigen processing		human(B8)	[Rowland-Jones (1993)]
p17(24-32)	GGKKKYKLK Naturally occurring variants GGKKKYQLK and GGKKRYRLK may act as antagonists	HIV-1 infection	human(B8)	[Klenerman (1994)]
p17(24-32)	GGKKKYKLK Longitudinal study of CTL response; GGRKKYKLK binds but not reactive	HIV-1 infection	human(B8)	[Nowak (1995)]
p17(24-32 LAI)	GGKKKYKL 8-mer, not 9-mer, established by crystallization studies, peptide titration equivocal, S. Rowland-Jones, per. comm.		human(B8)	[Scott Reid, manuscript submitted]
p17(25-35 SF2)	GGKKKYKLKHIV Longitudinal study of CTL escape mutants	HIV-1 infection	human(B8)	[Phillips (1991)]

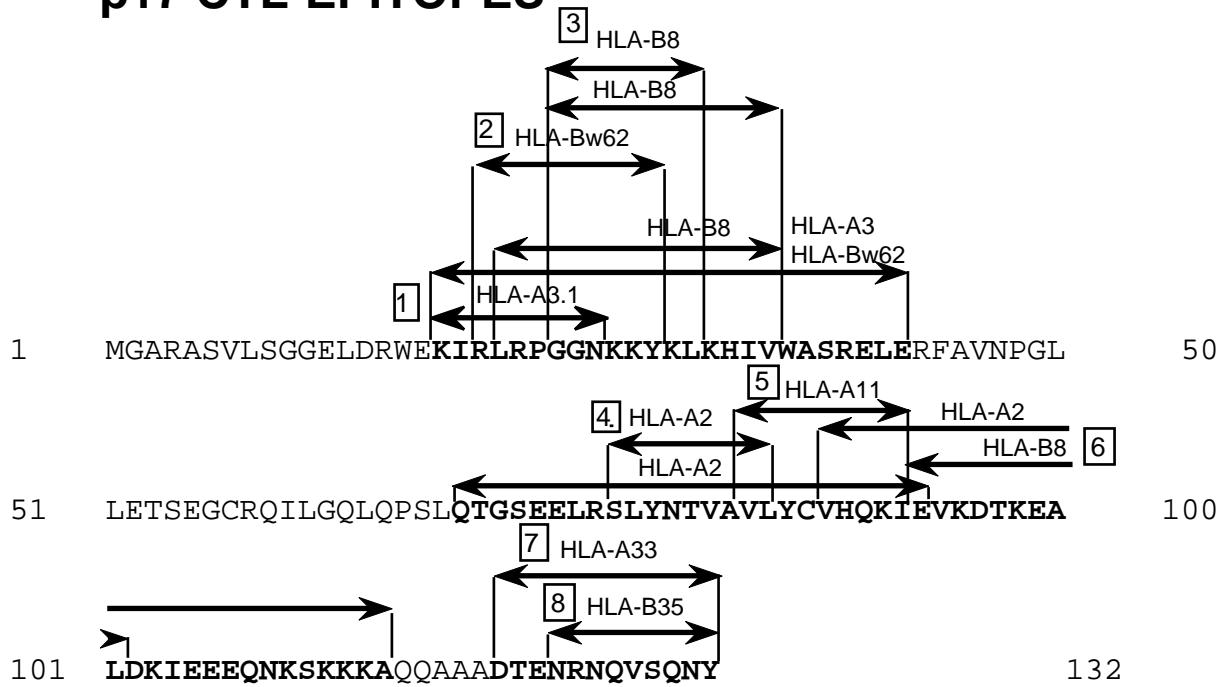
CTL p17 Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
p17(69-93 BH10)	QTGSEELRSLYNTVATLYCVHQRIE Gag CTL response studied in three individuals; epitopes mapped by peptide competition	HIV-1 infection	human(A2)	[Johnson (1991)]
p17(77-85 LAI)	SLYNTVATL Examined in the context of motifs important for HLA A2 binding	HIV-1 infection	human(A2)	[Parker (1992), Parker (1994)]
p17(77-85 LAI)	SLYNTVATL Review of HIV CTL epitopes; defined as minimal peptide by titration curve		human(A2)	[McMichael & Walker(1994)]
p17(77-85)	SLYNTVATL CTL clones recognize naturally processed peptide; peptide abundance corresponded to level of CTL killing	HIV-1 infection	human(A2)	[Tsomides (1994)]
p17(84-92)	TLYCVHQRI Unpublished, T. Harrer		human(A11)	[Brander & Walker(1995)]
p17(88-115 ARV)	VHQRIEIKDTKEALDKIEEQNKSKKKA B cell epitope HGP-30 also serves as a CTL epitope	HIV-1 infection	human(A2)	[Achour (1990)]
p17(93-101)	EIKDTKEAL Examined in the context of motifs important for HLA B8 binding		human(B8)	[DiBrino (1994b)]
p17(121-132 HXB2R)	DTGHSNQVSQNY Clustering of gag p24 CTL epitopes recognized in 29 HIV infected people	HIV-1 infection	human(A33)	[Buseyne (1993)]
p17(124-132 LAI)	NSSKVSQNY Review of HIV CTL epitopes; defined as minimal peptide by titration curve		human(B35)	[McMichael & Walker(1994)]
p17(124-132 LAI)	NSSKVSQNY Established by titration; HIV-2 equivalent PPGSKGGNY also recognized with B35 by CTL from HIV-2 seropositives	HIV-1 or -2 infection	human(B35)	[Rowland-Jones (1995)]

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HIV CTL Epitopes

p17 CTL-EPITOPES



Epitopes and protein variability:

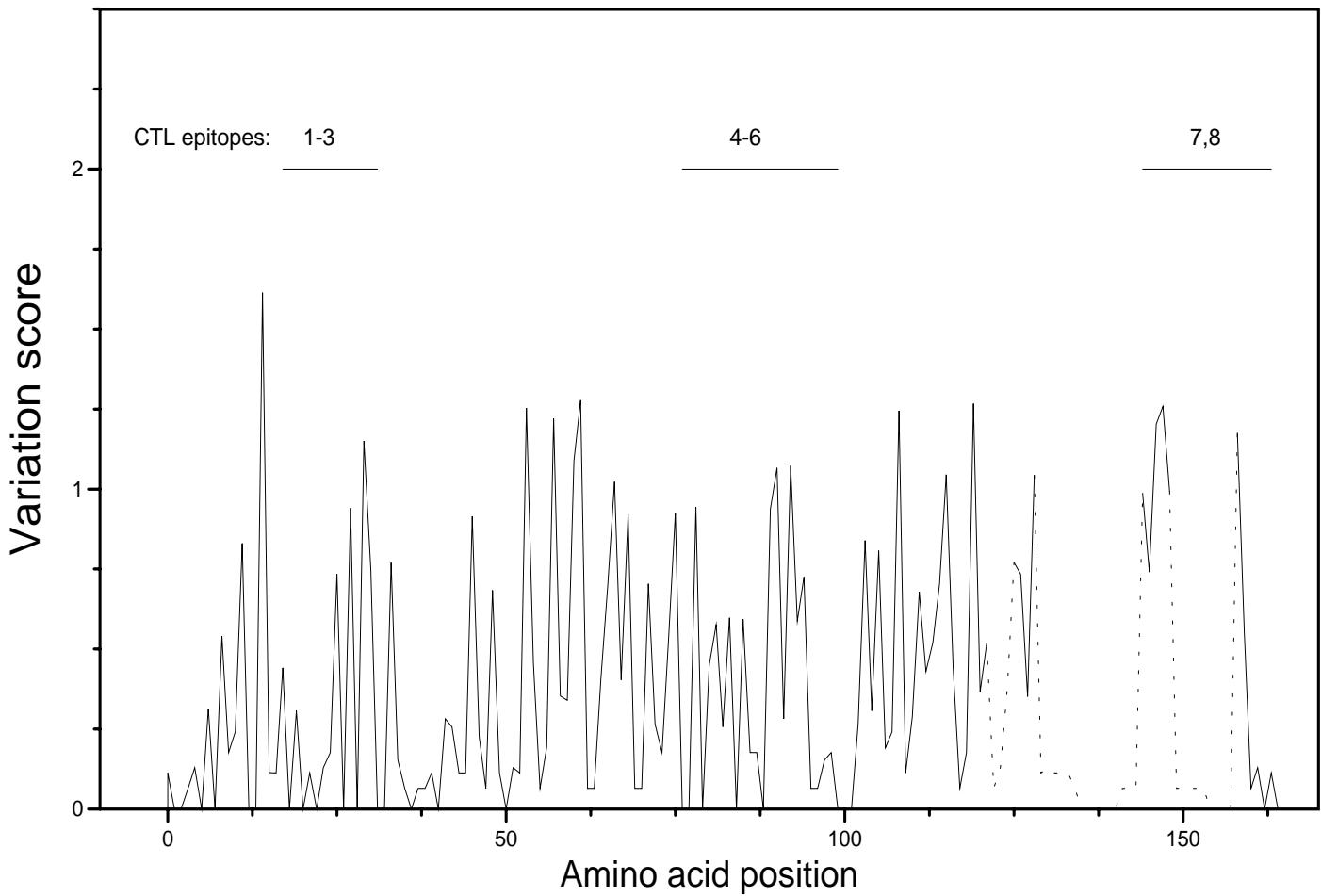
This plot shows a score that is a measure of variability for each position in the p17 protein alignment, and the relative positions of regions with defined CTL epitopes as seen on the CTL epitope map. The solid lines are positions where the most common character in a p17 protein alignment is an amino acid; the dashed lines represent regions where the most common character is an insertion (dash) incorporated to maintain the alignments. The alignment used corresponds to the 1995 p17 protein alignment, publically available at the Human Retroviruses and AIDS database, totaling 84 sequences. See the "how to use the CTL section" information for more details on the variability measure. The higher scores indicate more variation; 0 is perfectly conserved. The different protein alignments (gp120, gp41, p24, p15, p17, Nef and RT) used to create these plots contain different sets of sequences; therefore each plot is internally consistent, but cannot be compared to other protein plots.

Most common amino acid in each position in the p17 protein is shown below. The numbering corresponds to the numbering in the variability plot for the p17 protein.

p17 CONSENSUS:

MGARASVLSGGKLDWEKIRLRPGGKKYRLKHLWASRELERFALNPGL	50
LETSEGCQQILGQLQPALQTGSEELRSLYNTVATLYCVHQRIEVKDTKEA	100
--LDKIEEE-QNKSQK--TQQ---AAAD-----TGNSS-	150
-----QVSQNYP	

Variation in positions in the p17 protein



p17 CTL epitope 1
HLA-A3.1

CONSENSUS-B	KIRLRPGGK
Epitope1	-----
CONSENSUS-A	-----
HIVU455	-----N
HIVMAL	-----
HIVVI59	-----
HIVVI310	-----
HIVVI57	-----
HIVK112	-----
HIVK88	-----
HIVK29	-----
HIVK124	-----
HIVK7	-----
HIVK98	-----N
HIVK89	-----
HIVVI32	-----
HIVVI415	-----R
HIVCI4	-----
HIVG141	--Q----T
HIVLBV23	R-----
HIVTN243	-----R
HIVTN245	-----R
HIVTN240	-----R
HIVCI120	-----
HIVCI59	-----
HIVLBV2310	-----
HIVCI51	-----R
HIVLBV105	-----
HIVCI32	-----
HIVIC144	-----
HIVDJ258	-----
HIVCM238	-----R
HIVUG266	-----E--
HIVVI354	R-----
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-----
HIVPH153	-----
HIVPH136	R-----
HIVBZ200	-----
HIVTB132	-----
HIVBZ190	-----
HIVLAI	-----
HIVHXB2R	-----
HIVMN	N-----
HIVJH31	-----
HIVJRCSE	-----
HIVOYI	-----
HIVNY5CG	-----
HIVNL43	-----
HIVCDC41	-----
HIVHAN	-----
HIVCAM1	-----

CONSENSUS-B	KIRLRPGGK
HIVRF	-----R--
HIVD31	-----
HIVBH102	-----
HIVPV22	-----
HIVJRFL	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----E--
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-----
HIVUG268	--K-----
HIVSM145	R-----
HIVZAM18	-----
HIVZAM19	-----
HIVZAM20	-----
HIVDJ259	--K----R
HIVVI313	R-K-K---
CONSENSUS-D	-----
HIVELI	-----
HIVZZ6	-----
HIVNDK	R-----
HIVVI205	-----KS
HIVG109	R-----
HIVK31	--Q----H
HIVUG274	-----N
HIVUG270	-----N
HIVSE365	-----
HIVVI203	-----
CONSENSUS-F	-----
HIVVI174	--Q----
HIVVI69	-----R
HIVBZ162	-----
HIVVI325	-----S
CONSENSUS-G	-----
HIVLBV217	-----
HIVVI191	-----
CONSENSUS-H	-----
HIVVI525	-----
HIVVI557	-----
CONSENSUS-O	?---?---S-
HIVANT'0	Q---K---S-
HIVMVP51	R-----S-
CONSENSUS-CPZ	?-----?
SIVCPZGAB	-V-----R
SIVCPZANT	S-----
A?_HIVBZ126B	-----

HIV CTL Epitopes

p17 CTL epitope 2

HLA-Bw62, A3.1

CONSENSUS-B	RLRPGGKKKY	CONSENSUS-B	RLRPGGKKKY
Epitope2	-----	HIVRF	----R---R-
CONSENSUS-A	-----	HIVD31	-----
HIVU455	-----N---	HIVBH102	-----
HIVMAL	-----	HIVPV22	-----
HIVVI59	-----Q-	HIVJRLF	-----
HIVVI310	-----Q-	HIVUG280	-----
HIVVI57	-----	HIVYU2	-----Q-
HIVK112	-----	HIVBCSG3C	-----
HIVK88	-----	B_HIVMANC	-----
HIVK29	-----	B_HIV1U29413	----E---R-
HIVK124	-----	B_HIV1U29404	-----
HIVK7	-----	B_HIV1U29255	-----
HIVK98	-----N-R-	B_HIV1U29246	-----
HIVK89	-----	CONSENSUS-C	-----H-
HIVVI32	-----	HIVUG268	K-----C-
HIVVI415	-----R--	HIVSM145	-----H-
HIVCI4	-----	HIVZAM18	-----H-
HIVG141	Q-----T-R-	HIVZAM19	-----H-
HIVLBV23	-----	HIVZAM20	-----H-
HIVTN243	-----R--	HIVDJ259	K-----R-R-
HIVTN245	-----R--	HIVVI313	K-K-----H-
HIVTN240	-----R--	CONSENSUS-D	-----
HIVCI20	-----	HIVELI	-----
HIVCI59	-----	HIVZ2Z6	-----
HIVLBV2310	-----	HIVNDK	-----
HIVCI51	-----R-Q-	HIVVI205	----KS---
HIVLBV105	-----	HIVG109	-----
HIVCI32	-----	HIVK31	Q-----H---
HIVIC144	-----	HIVUG274	-----N---
HIVDJ258	-----	HIVUG270	-----N
HIVCM238	-----R--	HIVSE365	-----
HIVUG266	-----E----	HIVVI203	-----
HIVVI354	-----	CONSENSUS-F	-----
CONSENSUS-B	-----	HIVVI174	Q-----
HIVSF2	-----	HIVVI69	-----R---
HIVBZ167	-----	HIVBZ162	-----
HIVPH153	-----	HIVVI325	-----S---
HIVPH136	-----	CONSENSUS-G	-----?-
HIVBZ200	-----A-	HIVLBV217	-----
HIVTB132	-----	HIVVI191	-----Q-
HIVBZ190	-----R-	CONSENSUS-H	-----?-
HIVLAI	-----	HIVVI525	-----Q-
HIVHB2R	-----	HIVVI557	-----
HIVMN	-----	CONSENSUS-O	--?--S--?--
HIVJH31	-----	HIVANT70	--K--S----
HIVJRCSF	-----	HIVMVP51	-----S--A-
HIVOYI	-----	CONSENSUS-CPZ	-----?--?--
HIVNY5CG	-----Q-	SIVCPZGAB	-----R-R-
HIVNL43	-----Q-	SIVCPZANT	-----
HIVCDC41	-----Q-	A?_HIVBZ126B	-----Q-
HIVHAN	-----		
HIVCAM1	-----		

p17 CTL epitope 3**HLA-B8**

CONSENSUS-B	GGKKKYKLK
Epitope3	-----
CONSENSUS-A	-----R--
HIVU455	--N---R--
HIVMAL	-----R--
HIVVI59	----Q-R--
HIVVI310	----Q-R--
HIVVI57	-----R--
HIVK112	-----RI-
HIVK88	-----RM-
HIVK29	-----RM-
HIVK124	-----R--
HIVK7	-----R--
HIVK98	--N-R----
HIVVI32	-----RM-
HIVVI415	--R---RM-
HIVCI4	-----RM-
HIVG141	--T-R----
HIVLBV23	-----RM-
HIVTN243	--R---RM-
HIVTN245	--R---M-
HIVTN240	--R---R--
HIVCI120	-----R--
HIVCI159	-----R--
HIVLBV2310	-----R--
HIVCI151	--R-Q-R--
HIVLBV105	-----RM-
HIVCI132	-----
HIVIC144	-----R--
HIVDJ258	-----R--
HIVCM238	--R----I-
HIVUG266	E-----
HIVVI354	-----QI-
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-----R--
HIVPH153	-----Q--
HIVPH136	-----
HIVBZ200	----A----
HIVTB132	----R--
HIVBZ190	----R-Q--
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	-----
HIVJRCSF	-----R--
HIVOYI	----Q--
HIVNY5CG	----Q-R--
HIVNL43	----Q-----
HIVCDC41	----Q-R--
HIVHAN	----Q--
HIVCAM1	-----

CONSENSUS-B	GGKKKYKLK
HIVRF	R---R----
HIVD31	-----R--
HIVBH102	-----
HIVPV22	-----
HIVJRFL	-----R--
HIVUG280	-----
HIVYU2	----Q-R--
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	E---R----
B_HIV1U29404	-----Q--
B_HIV1U29255	-----Q--
B_HIV1U29246	-----R--
CONSENSUS-C	----H-MI-
HIVUG268	----C-MM-
HIVSM145	----H-MI-
HIVZAM18	----H-MI-
HIVZAM19	----H-MI-
HIVZAM20	----H-MI-
HIVDJ259	--R-R-M--
HIVVI313	----H-MM-
CONSENSUS-D	-----?--
HIVELI	-----R--
HIVZZ6	-----R--
HIVNDK	-----A--
HIVVI205	-KS---R--
HIVG109	-----Q--
HIVK31	--H-----
HIVUG274	--N-----
HIVUG270	--N-----
HIVSE365	-----
HIVVI203	-----R--
CONSENSUS-F	-----R?-
HIVVI174	-----RM-
HIVVI169	--R---M-
HIVBZ162	-----R--
HIVVI325	--S---R--
CONSENSUS-G	-----?R?-
HIVLBV217	-----RM-
HIVVI191	----Q-RI-
CONSENSUS-H	-----?R--
HIVVI525	----Q-R--
HIVVI557	-----R--
CONSENSUS-O	-S---?R--
HIVANT'0	-S----R--
HIVMVP51	-S--A-R--
CONSENSUS-CPZ	--?--?M?-
SIVCPZGAB	--R-R-MM-
SIVCPZANT	-----MI-
A?_HIVBZ126B	----Q-RM-

HIV CTL Epitopes

p17 CTL epitope 4

HLA-A2

CONSENSUS-B	SLYNTVATL
Epitope4	-----
CONSENSUS-A	--F-----
HIVU455	-----V-
HIVMAL	-----
HIVVI159	--F-A--V-
HIVVI310	--F--I-V-
HIVVI57	--F----V-
HIVK112	--F-----
HIVK88	--F-----
HIVK29	--F-----
HIVK124	--F-A--V-
HIVK7	-----
HIVK98	-----
HIVK89	--F-----
HIVVI32	-----V-
HIVVI415	-----
HIVCI4	-----
HIVG141	-----
HIVLBV23	--H----V-
HIVTN243	--F-----
HIVTN245	--F---V--
HIVTN240	--F-----
HIVCI20	--F--I---
HIVCI59	--F-AI-V-
HIVLBV2310	--F--I---
HIVCI51	--F-----
HIVLBV105	--F---V--
HIVCI32	-----I---
HIVIC144	--F--I---
HIVDJ258	-----I-V-
HIVCM238	--F-----
HIVUG266	-----V-
HIVVI354	--F-----
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-----
HIVPH153	-----
HIVPH136	--H-----
HIVBZ200	-----V-
HIVTB132	-----I-V-
HIVBZ190	--F-A--V-
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	--F-----
HIVJRCSF	-----
HIVOYI	-----
HIVNY5CG	--F----V-
HIVNL43	-----I-V-
HIVCDC41	-----
HIVHAN	-----
HIVCAM1	-----

CONSENSUS-B	SLYNTVATL
HIVRF	-----A----
HIVD31	--F-----
HIVBH102	-----
HIVPV22	-----
HIVJRLF	-----
HIVUG280	--F-----
HIVYU2	-----
HIVBCSG3C	-----I-V-
B_HIVMANC	-----V-
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	--H---V-
B_HIV1U29246	--F---VH
CONSENSUS-C	-----
HIVUG268	-----
HIVSM145	--F-----
HIVZAM18	--F---V--
HIVZAM19	--H-A--V-
HIVZAM20	-----
HIVDJ259	-----
HIVVI313	--H-----
CONSENSUS-D	--?-----
HIVELI	-----
HIVZ2Z6	--F-----
HIVNDK	-----
HIVVI205	--F-----
HIVG109	-----
HIVK31	-----
HIVUG274	--F-----
HIVUG270	--F-----
HIVSE365	-----I---
HIVVI203	--F-----
CONSENSUS-F	--?---?V-
HIVVI174	--F--IVV-
HIVVI69	-----V-
HIVBZ162	-----V-
HIVVI325	--F---V--
CONSENSUS-G	--?-??-?-
HIVLBV217	--F-A--V-
HIVVI191	-----I---
CONSENSUS-H	--F-LL-?-
HIVVI525	--F-LL-V-
HIVVI557	--F-LL---
CONSENSUS-O	--W-AI?V-
HIVANT70	--W-AIVV-
HIVMVP51	--W-AI-V-
CONSENSUS-CPZ	--F---?V-
SIVCPZGAB	--F--L-V-
SIVCPZANT	--F--ICV-
A?_HIVBZ126B	-----V-

p17 CTL epitope 5

HLA-A11

CONSENSUS-B	TLYCVHQRI
Epitope5	-----
CONSENSUS-A	-----
HIVU455	V-----
HIVMAL	-----
HIVVI59	V-----
HIVVI310	V-----
HIVVI57	V-----
HIVK112	-----
HIVK88	-----
HIVK29	-----
HIVK124	V-----
HIVK7	----RQ-
HIVK98	-----
HIVK89	--W---Q-
HIVVI32	V-F-----
HIVVI415	-----
HIVCI4	-----
HIVG141	----A--
HIVLBV23	V-----
HIVTN243	--W-----
HIVTN245	--W-----
HIVTN240	--W-----
HIVCI120	--W-----
HIVCI159	V-W-----
HIVLBV2310	--W-----
HIVCI151	--W-----
HIVLBV105	--L-----
HIVCI132	--W---R--
HIVIC144	----I----
HIVDJ258	V-W-----
HIVCM238	--W-----
HIVUG266	V-----
HIVVI354	-----K-
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-----K-
HIVPH153	-----N-
HIVPH136	-----K-
HIVBZ200	V---A--K-
HIVTB132	V-----K-
HIVBZ190	V-----Q-
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----K-
HIVJH31	-----
HIVJRCASF	-----
HIVOYI	-----K-
HIVNY5CG	V-----
HIVNL43	V-----
HIVCDC41	-----
HIVHAN	-----K-
HIVCAM1	-----K-

CONSENSUS-B	TLYCVHQRI
HIVRF	-----N-
HIVD31	-----
HIVBH102	-----
HIVPV22	-----
HIVJRFL	-----
HIVUG280	-----
HIVYU2	-----K-
HIVBCSG3C	V-----M-
B_HIVMANC	V-----G-
B_HIV1U29413	-----
B_HIV1U29404	-----K-
B_HIV1U29255	V-----
B_HIV1U29246	VH-----
CONSENSUS-C	-----E?-
HIVUG268	-----KG-
HIVSM145	-----EK-
HIVZAM18	--W---ED-
HIVZAM19	V-----Kx-
HIVZAM20	-----AG-
HIVDJ259	-----A--
HIVVI313	-----EK-
CONSENSUS-D	-----E--
HIVELI	-----KG-
HIVZZ6	-----E--
HIVNDK	-----E--
HIVVI205	-----K--
HIVG109	-----N--
HIVK31	-----AG-
HIVUG274	-----E--
HIVUG270	-----E--
HIVSE365	-----EK-
HIVVI203	-----
CONSENSUS-F	V---F----V
HIVVI174	V---Y----V
HIVVI69	V---F---KV
HIVBZ162	V---F----V
HIVVI325	-----
CONSENSUS-G	?---?---
HIVLBV217	V-W-I----
HIVVI191	-----
CONSENSUS-H	?-----
HIVVI525	V-----
HIVVI557	-----
CONSENSUS-O	V-W---N-?
HIVANT'0	V-W---N-Y
HIVMVP51	V-W---N-F
CONSENSUS-CPZ	V-W-?---???
SIVCPZGAB	V-W-I-SD-
SIVCPZANT	V-W---KGE
A?_HIVBZ126B	V---Y-----

HIV CTL Epitopes

p17 CTL epitope 6

HLA-B8

CONSENSUS-B	EVKDTKEAL
Epitope6	-I-----
CONSENSUS-A	D-----
HIVMAL	D-----
HIVVI59	DI-----
HIVVI310	-----
HIVVI57	-----D--
HIVK112	D-----
HIVK88	D-----
HIVK29	-----A---
HIVK124	-----
HIVK7	-----
HIVK98	D-----
HIVK89	N-----
HIVVI32	D-----
HIVVI415	D-----
HIVCI4	D-----
HIVG141	-I-----
HIVLBV23	D-----
HIVTN243	-----
HIVTN245	-----
HIVTN240	-----
HIVCI20	DI-----
HIVCI59	DI-----
HIVLBV2310	D-----
HIVCI51	DI-----
HIVLBV105	--R----I
HIVCI32	-I-----
HIVIC144	DIR----
HIVDJ258	DI-----
HIVCM238	-----
HIVUG266	-I-----
HIVVI354	N-----
CONSENSUS-B	-----
HIVSF2	D-----
HIVBZ167	D-R-----
HIVPH153	-----
HIVPH136	D-----
HIVBZ200	D-----
HIVTB132	-----
HIVBZ190	-----
HIVLAI	-I-----
HIVHXB2R	-I-----
HIVMN	-I-----
HIVJH31	-----
HIVJRCSF	-I-----
HIVOYI	-----
HIVNY5CG	D-----
HIVNL43	D-----
HIVCDC41	--R----
HIVHAN	-----
HIVCAM1	D-----

CONSENSUS-B	EVKDTKEAL
HIVRF	--R-----
HIVD31	-----
HIVBH102	-I-----
HIVPV22	-I-----
HIVJRLF	-----
HIVUG280	D-----
HIVYU2	-----
HIVBCSG3C	D-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	D-----
B_HIV1U29255	D-----
B_HIV1U29246	D-----
CONSENSUS-C	--R-----
HIVUG268	--R-----
HIVSM145	--R-----
HIVZAM18	T-R-----
HIVZAM20	--R-----
HIVDJ259	-IQ-----
HIVVI313	-IR-----
CONSENSUS-D	-----
HIVELI	D-----
HIVZ2Z6	-----
HIVNDK	-----V
HIVVI205	-----
HIVG109	-----
HIVK31	K-TN-----
HIVUG274	K-T-----
HIVUG270	K-A-----
HIVSE365	-----V
HIVVI203	-----
CONSENSUS-F	-?-----
HIVVI174	-I-----
HIVVI69	-----
HIVBZ162	-----
HIVVI325	-IR-----
CONSENSUS-G	-----
HIVLBV217	G-----
HIVVI191	-I---Q---
G_HIVJV831	-----
CONSENSUS-H	D?-----
HIVVI525	DI-----
HIVVI557	D-----
CONSENSUS-O	?I?--QQ-I
HIVANT70	KIG--QQ-I
HIVMVP51	DIR--QQ-I
CONSENSUS-CPZ	???--??-?
SIVCPZGAB	T-E--QK--
SIVCPZANT	KI---EQ-V
A?_HIVBZ126B	-----

p17 CTL epitope 7**HLA-A33**

CONSENSUS-B	DTGNSSQVSQNY
Epitope7	---H-N-----
CONSENSUS-A	---?--K-----
HIVU455	QAAANTG-----
HIVMAL	A-K---S-----
HIVVI59	N----NK-----
HIVVI310	--.---K--H--
HIVVI57	-----K-----
HIVK112	--ES--K-----
HIVK88	-----K-----
HIVK29	A-----K-----
HIVK124	-----K-----
HIVK7	-----K-----
HIVK98	-----K-----
HIVK89	----N-K-----
HIVVI32	----GK-----
HIVVI415	G----N-----
HIVCI4	-----R-----
HIVG141	A--SR-ST----
HIVLBV23	----G-K-----
HIVTN243	G--S--K-----
HIVTN245	G--S--K-----
HIVTN240	G--S--K-----
HIVCI120	TAAATGSS-----
HIVCI159	AAAATGSG-----
HIVLBV2310	AAAATGSS-----
HIVCI151	AAAATGSS-----
HIVLBV105	--S-NKG---V
HIVCI132	AAAATGSN-----
HIVCM238	G--S--K-----
HIVUG266	N----NK-----
HIVVI354	A-E---K-----
CONSENSUS-B	-----
HIVSF2	G-----
HIVBZ167	-A-T-----
HIVPH153	---SC-----
HIVPH136	---K-----
HIVBZ200	---K-----
HIVTB132	N-E-----
HIVBZ190	---N-----
HIVLAI	---H-----
HIVHXB2R	---H-N-----
HIVMN	NR-----
HIVJH31	-----K-----
HIVJRCSE	-----
HIVOYI	-----
HIVNY5CG	-----
HIVNL43	---N-----
HIVCDC41	-----
HIVHAN	-A--RN-----
HIVCAM1	G-----
HIVRF	---G-----

CONSENSUS-B	DTGNSSQVSQNY
HIVD31	-A--N-----
HIVBH102	---H-----
HIVPV22	---H-----
HIVJRLF	-----
HIVUG280	G-----
HIVYU2	-----
HIVBCSG3C	-----R--
B_HIVMANC	-----H--
B_HIV1U29413	G-----
B_HIV1U29404	-----K---
B_HIV1U29255	N----N-I---
B_HIV1U29246	-A--N-----
CONSENSUS-C	AKAADGK-----
HIVUG268	E-ADKGK-----
HIVSM145	AKAADGK-----
HIVZAM18	AKAADG-----
HIVZAM19	AKEADGK-----
HIVZAM20	AKTADGK---F
HIVDJ259	E-ADKGK---F
HIVVI313	AAADNGK-----
CONSENSUS-D	--R-----
HIVELI	-----N-----
HIVZ2Z6	-A--N-----
HIVNDK	AAAD-----
HIVVI205	--K-----
HIVG109	--R--N-----
HIVK31	--R-----
HIVUG274	--R-----
HIVUG270	--R-----
HIVSE365	-S--N-----
HIVVI203	--R-----
CONSENSUS-F	Q?AADKG-----
HIVVI174	QQAADKG-----
HIVVI169	QVAADKG-----
HIVBZ162	QAAADKG-----
HIVVI325	QETANKG-----
CONSENSUS-G	E?-----
HIVLBV217	-K-DN-----
HIVVI191	EE-----
HIVTAIG	EK-----
G_HIVJV831	NE---NP-----
CONSENSUS-H	-K????K?----
HIVVI525	-KEKDKK-----
HIVVI557	-K--GNKI----
CONSENSUS-O	E?TS?R-?----
HIVANT70	EDTSAR-AG---
HIVMVP51	EETSPR-T----
SIVCPZGAB	GASA-AGI-G--
SIVCPZANT	CQRHL-GEGR--
A?_HIVBZ126B	AADTG-SS----

HIV CTL Epitopes

p17 CTL epitope 8

HLA-B35

CONSENSUS-B	NSSQVSQNY	CONSENSUS-B	NSSQVSQNY
Epitope8	---K-----	HIVD31	-N-----
CONSENSUS-A	?--K-----	HIVBH102	H-----
HIVU455	ANTGS----	HIVPV22	H-----
HIVMAL	---S-----	HIVJRLF	-----
HIVVI59	--NK-----	HIVUG280	-----
HIVVI310	---K--H--	HIVYU2	-----
HIVVI57	---K-----	HIVBCSG3C	-----R--
HIVK112	S--K-----	B_HIVMANC	-----H--
HIVK88	---K-----	B_HIV1U29413	-----
HIVK29	---K-----	B_HIV1U29404	---K-----
HIVK124	---K-----	B_HIV1U29255	--N-I----
HIVK7	---K-----	B_HIV1U29246	-N-----
HIVK98	---K-----	CONSENSUS-C	ADGK-----
HIVK89	-N-K-----	HIVUG268	DKGK-----
HIVVI32	--GK-----	HIVSM145	ADGK-----
HIVVI415	---N-----	HIVZAM18	ADG-----
HIVCI4	--R-----	HIVZAM19	ADGK-----
HIVG141	SR-ST----	HIVZAM20	ADGK----F
HIVLBV23	-G-K-----	HIVDJ259	DKGK----F
HIVTN243	S--K-----	HIVVI313	DNGK-----
HIVTN245	S--K-----	CONSENSUS-D	-----
HIVTN240	S--K-----	HIVELI	-N-----
HIVCI20	ATGSS----	HIVZ2Z6	-N-----
HIVCI59	ATGSG----	HIVNDK	D-----
HIVLBV2310	ATGSS----	HIVVI205	-----
HIVCI51	ATGSS----	HIVG109	--N-----
HIVLBV105	S-NKG---V	HIVK31	-----
HIVCI32	ATGSN----	HIVUG274	-----
HIVCM238	S--K-----	HIVUG270	-----
HIVUG266	--NK-----	HIVSE365	-N-----
HIVVI354	---K-----	HIVVI203	-----
CONSENSUS-B	-----	CONSENSUS-F	ADKG-----
HIVSF2	-----	HIVVI174	ADKG-----
HIVBZ167	T-----	HIVVI69	ADKG-----
HIVPH153	SC-----	HIVBZ162	ADKG-----
HIVPH136	-K-----	HIVVI325	ANKG-----
HIVBZ200	---K-----	CONSENSUS-G	-----
HIVTB132	-----	HIVLBV217	DN-----
HIVBZ190	-N-----	HIVVI191	-----
HIVLAI	H-----	HIVTAIG	-----
HIVHXB2R	H-N-----	G_HIVJV831	--NP-----
HIVMN	-----	CONSENSUS-H	???K?----
HIVJH31	--K-----	HIVVI525	KDKK-----
HIVJRCSF	-----	HIVVI557	-GNKI----
HIVOYI	-----	CONSENSUS-O	S?R-??---
HIVNY5CG	-----	HIVANT70	SAR-AG---
HIVNL43	-N-----	HIVMVP51	SPR-T----
HIVCDC41	-----	SIVCPZGAB	A-AGI-G--
HIVHAN	-RN-----	SIVCPZANT	HL-GEGR--
HIVCAM1	-----		
HIVRF	-G-----	A? <u>_HIVBZ126B</u>	TG-SS----

p24 CTL Epitopes

CTL p24 Epitopes

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Location	Epitope Comments	Antigen	Species(HLA)	Reference
p24(140-152 IIIB)	GQMVKHQQAISPRTL Fine specificity of human Cw3 restricted gag CTL epitope	HIV-1 infection	human(Cw3)	[Littauu (1991)]
p24(143-164 BH10)	VHQQAISPRTLNAWVKVVEEKAF Gag CTL response studied in three individuals; epitopes mapped by peptide competition	HIV-1 infection	human(Bw57)	[Johnson (1991)]
p24(147-155 PV22)	ISPRTLNAW Unpublished, B. Wilkens		human(B57)	[Brander & Walker(1995)]
p24(151-159)	TLNAWVKVV Study of sequence motifs preferred for peptide binding to class I HLA A2	HIV-1 infection	human(A2)	[Parker (1992), Parker (1994)]
p24(153-174 BH10)	NAWVKVVEEKAFSPEVPMFSA Gag CTL response studied in three individuals; epitopes mapped by peptide competition	HIV-1 infection	human(Bw57)	[Johnson (1991)]
p24(164-183)	AFSPEVIPMFSALSEGATPQ More refined characterization of this epitope is in progress, P. Goulder, per. comm.	HIV-1 infection	human(A26)	P. Goulder, per. comm.
p24(169-184 LAI)	IPMFSALSEGATPQDL Clustering of gag p24 CTL epitopes recognized in 29 HIV infected people	HIV-1 infection	human(B12(44))	[Buseyne (1993)]
p24(173-194 BH10)	SALSEGATPQDLNTMLNTVGHH Gag CTL response studied in three individuals; epitopes mapped by peptide competition	HIV-1 infection	human(B14)	[Johnson (1991)]
p24(183-191 LAI)	DLNTMLNTV Review of HIV CTL epitopes; defined by B14 motif found within a larger peptide	HIV-1 infection	human(B14)	[McMichael & Walker(1994)]
p24(193-214 BH10)	GHQAAMQMLKETINEAAEWDR Gag CTL response studied in three individuals; epitopes mapped by peptide competition	HIV-1 infection	human(Bw52)	[Johnson (1991)]
p24(193-203 BRU)	GHQAAMQMLKE 1 of 4 epitopes predicted then shown to stimulate HLA-A2 restricted CTL line	HIV-1 infection	human(A2)	[Claverie (1988)]
p24(203-212)	ETINEAAEW AIDS 1995 in press, per. comm. S. Rowland-Jones		P	[Klenerman, AIDS 1995 in press]
p24(219-233 BRU)	HAGPIAPGQMREPRG 1 of 4 epitopes predicted then shown to stimulate HLA-A2 restricted CTL line	HIV-1 infection	human(A2)	[Claverie (1988)]

CTL p24 Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
p24(240-249)	TSTLQEIQIGW This is the optimal peptide; response in 3/4 HLA-B57 individuals, 2 were long term survivors; B5801 B cells make good targets, but not yet tested in HLA-B5801 individuals	HIV-1 infection	human(B57,B5801)	P. Goulder, per. comm.
p24(253-274 BH10)	NPPIPVGEIYKRWIILGLNKIV Gag CTL response studied in three individuals; epitopes mapped by peptide competition	HIV-1 infection	human(B8)	[Johnson (1991)]
p24(253-267)	NPPIPVGEIYKRWII High frequency of memory and effector gag specific CTL	HIV-1 infection	human(B8)	[Gotch (1990)]
p24(255-274 SF2)	NPPIPVGEIYKRWIILGLNK Gag CTL epitope precursor frequencies estimated and peptide mapping	HIV-1 infection	human(?)	[van Baalen (1993)]
p24(255-274 SF2)	NPPIPVGEIYKRWII Longitudinal study of CTL escape mutants	HIV-1 infection	human(B8)	[Phillips (1991)]
p24(256-270 LAI)	IPVGEIYKRWIILGL Clustering of gag p24 CTL epitopes recognized in 29 HIV infected people	HIV-1 infection	human(B8)	[Buseyne (1993)]
p24(260-268 LAI)	PPIPGDIY Defined as minimal peptide by titration curve, PPIPVGEIY and HIV-2 form NPVPVGNIY also recognized	HIV-1 or -2 infection	human(B35)	[Rowland-Jones (1995)]
p24(260-268 LAI)	PPIPGDIY Review of HIV CTL epitopes; defined as minimal peptide by titration curve		human(B35)	[McMichael & Walker(1994)]
p24(261-269)	GEIYKRWII Predicted epitope based on B8 binding motifs, from larger peptide NPPIPVGEIYKRWII		human(B8)	[Sutton (1993)]
p24(259-267 LAI)	GEIYKRWII Naturally occurring variant GDIYKRWII may act as antagonist	HIV-1 infection	human(B8)	[Klenerman (1994)]
p24(259-267)	GEIYKRWII Longitudinal study of CTL response; GDIYKRWII could also stimulate CTL, reactivity fluctuated	HIV-1 infection	human(B8)	[Nowak (1995)]
p24(259-267)	GEIYKRWII Equivalent sequence GDIYKRWII also recognized by CTL from some donors		human(B8)	[S. Rowland-Jones, per. comm.]
p24(265-280 BRU)	YKRWIILGLNKIVRMYSP Used as a positive control for HLA specificity	HIV-1 infection	human(B27)	[Dadaglio (1991)]

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CTL p24 Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
p24(263-284 BH10)	KRWIILGLNKIVRMYSPSILD Gag CTL response studied in three individuals; epitopes mapped by peptide competition	HIV-1 infection	human(Bw62)	[Johnson (1991)]
p24(265-284 SF2)	KRWIILGLNKIVRMYSPTSI Gag CTL epitope precursor frequencies estimated; HLA Bw62 restriction considered most likely	HIV-1 infection	human(Bw62?)	[van Baalen (1993)]
p24(266-277)	KRWIILGLNKIVRMY Gag CTL epitope mapped with rec gag-vaccinia and synthetic peptides	rec gag-vaccinia	human(B27)	[Nixon (1988)]
p24(263-277 LAI)	KRWIILGLNKIVMRY Clustering of gag p24 CTL epitopes recognized in 29 HIV infected people	HIV-1 infection	human(A33))	[Buseyne (1993)]
p24(266-277 LAI)	KRWIILGLNKIVRMY Longitudinal study showing persistence of epitope despite CTL activity	HIV-1 infection	human(B27)	[Meyerhans (1991)]
p24(265-279)	KRWIILGLNKIVRMY HIV 1 and HIV 2 cross-reactive CTL clone, highly conserved epitope	HIV-1 infection	human(B27)	[Nixon (1990)]
p24(265-279C)	KRWIILGLNKIVRMYC HLA B27 restricted epitope also binds to HLA A2 and HLA B37 in solid phase assay		human(B27)	[Bouillot (1989)]
p24(265-276)	KRWIILGLNKIV Epitope examined in the context of peptide binding to HLA B27		human(B27)	[Jardetzky (1991)]
p24(263-272 LAI)	KRWIILGLNK Clustering of gag p24 CTL epitopes recognized in 29 HIV infected people	HIV-1 infection	human(B27)	[Buseyne (1993)]
p24(263-272 LAI)	KRWIILGLNK Review of HIV CTL epitopes; defined as minimal peptide by titration curve	HIV-1 infection	human(B27)	[McMichael & Walker(1994)]
p24(263-272)	KRWIIMGLNK Naturally occurring variant KRWIILGLNK may act as antagonist	HIV-1 infection	human(B27)	[Klenerman (1994)]
p24(265-276)	KRWIILGLNK Included in B27 binding peptide competition study		human(B27)	[Carreno (1992)]
p24(265-274 SF2)	KRWIILGLNK Longitudinal study of CTL escape mutants	HIV-1 infection	human(B27)	[Phillips (1991)]

CTL p24 Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
p24(263-272)	KRWIIMGNK	HIV-1 infection	human(B27)	[Nowak (1995)]
	Longitudinal study of CTL response; KRWIILGNK was also found, both forms stimulate CTL			
p24(268-277 LAI)	LGLNKIVRMY		human(Bw62)	[McMichael & Walker(1994)]
	Review of HIV CTL epitopes; defined by Bw62 motif found within a larger peptide			
p24(298-306 LAI)	DRFWKTLRA		human(B14)	[Brander & Walker(1995)]
	Unpublished, T. Harrer; defined as minimal peptide by titration curve [McMichael & Walker(1994)]			
p24(305-314)	RAEQASQEVK	HIV-1 infection	human(Cw8)	[Johnson (1991)]
	Originally reported as HLA B14 restricted, but subsequently found not to be presented by cells transfected with B14. Thought to be Cw8 restricted (C. Brander and B. Walker)			
p24(305-313)	RAEQASQEV	HIV-1 infection	human(B14?)	[Price (1995)]
	Study of cytokines released by HIV-1 specific activated CTL; HLA restriction uncertain, see p24(305-314)			
p24(323-337)	VQNANPDCKTILKAL		human(B8)	[Nixon & McMichael(1991)]
	Two CTL epitopes defined			
I-23 NOV95	p24(325-339 SF2)	VQNANPDCKTILKAL	HIV-1 infection	human(B8) [Phillips (1991)]
	Longitudinal study of CTL escape mutants			
p24(324-335 PV22)	QANANPDCKTILK		human(B51)	[Brander & Walker(1995)]
	B. Wilkens, unpublished			
p24(329-337 LAI)	DCKTILKAL		human(B8)	[Sutton (1993)]
	Predicted epitope based on B8 binding motifs, from larger peptide VQNANPDCKTILKAL			
p24(329-337)	DCKTILKAL	HIV-1 infection	human(B8)	[Nowak (1995)]
	Longitudinal study of CTL response; DCRTILKAL was also found, binds but not recognized			
p24(329-337)	DCKTILKAL		human(B8)	[S. MacAdam, in press]
	defined as minimal epitope by titration and binding studies S. RowlandJones, per. comm.			
p24(345-364 SF2)	LEEMMTACQGVGGPGHKARV	HIV-1 infection	human(?)	[van Baalen (1993)]
	Gag CTL epitope precursor frequencies estimated, peptide mapping			

p24 CTL-EPITOPES



Epitopes and protein variability:

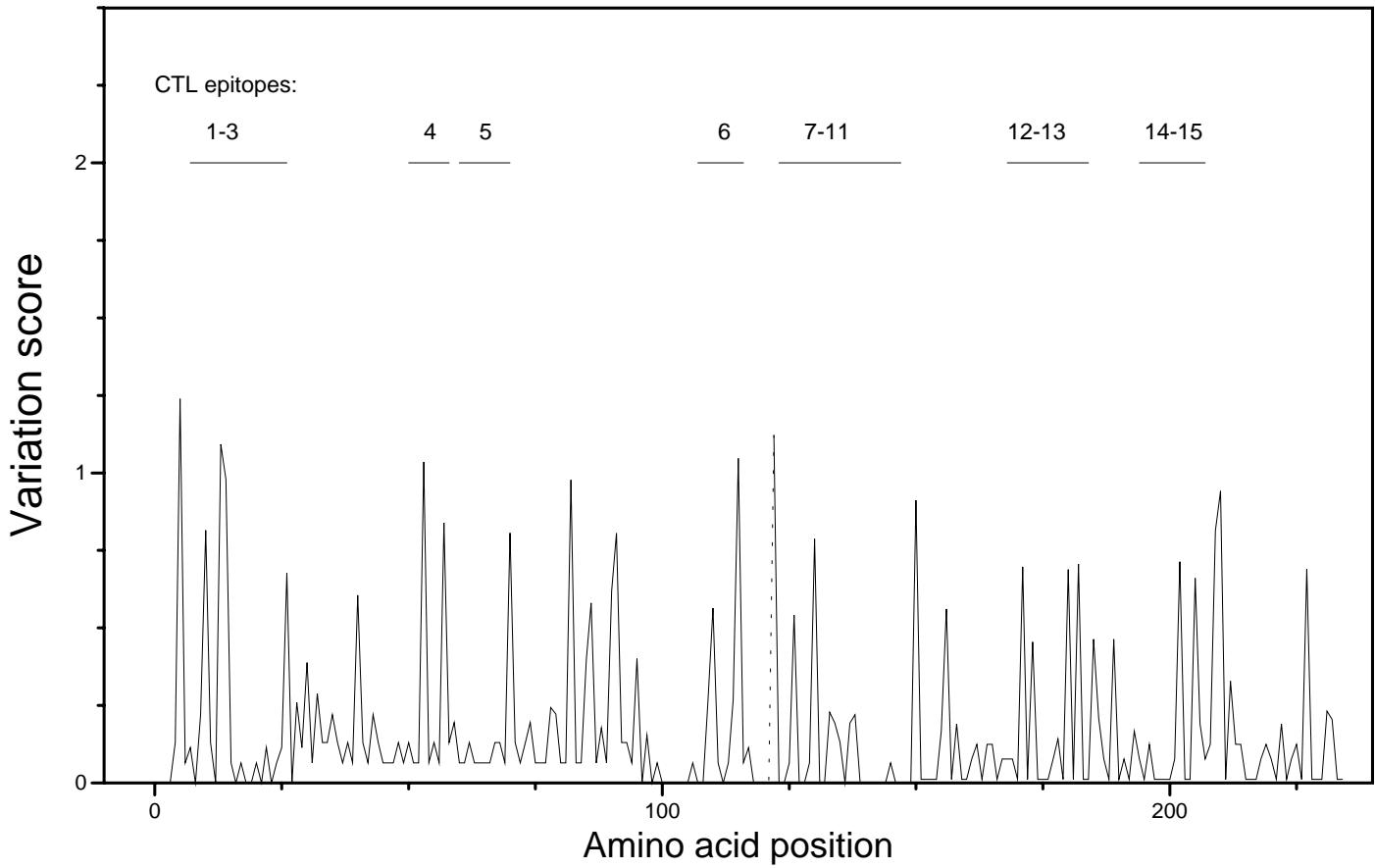
This plot shows a score that is a measure of variability for each position in the p24 protein alignment, and the relative positions of regions with defined CTL epitopes as seen on the CTL epitope map. The solid lines are positions where the most common character in a p24 protein alignment is an amino acid; the dashed lines represent regions where the most common character is an insertion (dash) incorporated to maintain the alignments. The alignment used corresponds to the 1995 p24 protein alignment, publically available at the Human Retroviruses and AIDS database, totaling 83 sequences. See the "how to use the CTL section" information for more details on the variability measure. The higher scores indicate more variation; 0 is perfectly conserved. The different protein alignments (gp120, gp41, p24, p15, p17, Nef and RT) used to create these plots contain different sets of sequences; therefore each plot is internally consistent, but cannot be compared to other protein plots.

Most common amino acid in each position in the p24 protein is shown below. The numbering corresponds to the numbering in the variability plot for the p24 protein.

P24 CONSENSUS:

PIVQNLQGQMVKHQAI SPRTLN AWVKVIEEKAFSPEVIPMFSALSEGATPQ	50
DLNTMLN T VGGHQAA M QMLKDTINEE AAEWDR LHPVHAGPIAPGQMREPR	100
GSDIAGTTSTLQE QIGWMT---SNPP IPVGEIYKRWIILGLNKIVRMYSP	150
VSILD I RQGPKE PFRDYVDRFY KTLRAE QATQE VKNWM TETLLVQNANPD	200
CKTILK ALGP GAT LEEM MTAC QGVGGPGHKARVLA	

Variation in positions in the p24 protein



p24 CTL epitope 1**HLA-Cw3**

CONSENSUS-B	GQMVHQAISPRTL
Epitope1	-----
CONSENSUS-A	---?---L-----
HIVU455	--P---L-----
HIVMAL	--I-----
HIVVI159	--I---L--K--
HIVVI310	----SL-----
HIVVI57	--I---V-----
HIVK112	--I--NL-----
HIVK88	--I--TL-----
HIVK29	--T--SL-----
HIVK124	--I--SL-----
HIVK7	R--I--NL-----
HIVK98	--I--NL-----
HIVK89	--IL-TL-----
HIVVI32	--I--SL-----
HIVVI415	--I-----
HIVCI4	-----S-----
HIVG141	-----
HIVLBV23	--I---L-----
HIVTN243	-----PL-----
HIVTN245	--A--PL-----
HIVTN240	--A--PL-----
HIVCI20	--T--SM-----
HIVCI59	--T--PM-----
HIVLBV2310	--T--PM-----
HIVCI51	--T--S-----
HIVLBV105	-----PV-----
HIVCI32	-----L-----
HIVIC144	--T--P-----
HIVDJ258	-----PM-----
HIVCM238	-----PL-----
HIVUG266	R--TY--L-----
HIVVI354	-----M-----
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-----
HIVPH153	-----
HIVPH136	-----L-----
HIVBZ200	-----
HIVTB132	-----
HIVBZ190	-----
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	-----
HIVJRCASF	-----
HIVOYI	-----P-----
HIVNY5CG	-----
HIVNL43	-----
HIVCDC41	-----
HIVHAN	-----
HIVCAM1	-----
HIVRF	-----

CONSENSUS-B	GQMVHQAISPRTL
HIVD31	-----P-----
HIVBH102	-----
HIVPV22	-----
HIVJRLF	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----S-----
B_HIV1U29413	-----PL-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-----
HIVUG268	-----L-----
HIVSM145	-----
HIVZAM18	--I-----
HIVZAM19	-----
HIVZAM20	-----
HIVDJ259	-----PL-----
HIVVI313	-----PM-----
CONSENSUS-D	-----
HIVELI	-----
HIVZ2Z6	-----
HIVNDK	-----
HIVVI205	-----
HIVG109	-----L-----
HIVK31	-----VM-----
HIVUG274	-----
HIVUG270	-----
HIVSE365	-----L-----
HIVVI203	-----L-----
CONSENSUS-F	-----
HIVVI174	-----
HIVVI69	-----
HIVBZ162	-----S-----
HIVVI325	-----PL-----
CONSENSUS-G	---?---?
HIVLBV217	-----P-----
HIVVI191	-----PLT-----
HIVTAIG	--PI-----
G_HIVJV831	--I-----
CONSENSUS-H	--?-----
HIVVI525	-----
HIVVI557	--P-----
CONSENSUS-O	-----
HIVANT70	-----
HIVMVP51	-----
CONSENSUS-CPZ	-????-????-
SIVCPZGAB	-----
SIVCPZANT	-IAR--PLT-----
A?_HIVBZ126B	-----

HIV CTL Epitopes

p24 CTL epitope 2		CONSENSUS-B	ISPRTLNAW
HLA-B57		HIVBH102	-----
CONSENSUS-B	ISPRTLNAW	HIVPV22	-----
Epitope2	-----	HIVJRLF	-----
CONSENSUS-A	L-----	HIVUG280	-----
HIVU455	L-----	HIVYU2	-----
HIVMAL	-----	HIVBCSG3C	-----
HIVVI310	L-----	B_HIVMANC	-----
HIVVI57	V-----	B_HIV1U29413	L-----
HIVK112	L-----	B_HIV1U29404	-----
HIVK88	L-----	B_HIV1U29255	-----
HIVK29	L-----	B_HIV1U29246	-----
HIVK124	L-----	CONSENSUS-C	-----
HIVK98	L-----	HIVUG268	L-----
HIVK89	L-----	HIVSM145	-----
HIVVI32	L-----	HIVZAM18	-----
HIVVI415	-----	HIVZAM19	-----
HIVCI4	-----	HIVZAM20	-----
HIVG141	-----	HIVDJ259	L-----
HIVLBV23	L-----	HIVVI313	M-----
HIVTN243	L-----	CONSENSUS-D	-----
HIVTN245	L-----	HIVELI	-----
HIVTN240	L-----	HIVZZ6	-----
HIVCI20	M-----	HIVNDK	-----
HIVCI59	M-----	HIVVI205	-----
HIVLBV2310	M-----	HIVK31	M-----
HIVCI51	-----	HIVUG274	-----
HIVLBV105	V----D--	HIVUG270	-----
HIVCI32	L-----	HIVSE365	L-----
HIVIC144	-----	HIVVI203	L-----
HIVDJ258	M-----	CONSENSUS-F	-----
HIVCM238	L-----	HIVVI174	-----
HIVVI354	M-----	HIVVI69	-----
CONSENSUS-B	-----	HIVBZ162	-----
HIVSF2	-----	HIVVI325	L-----
HIVBZ167	-----	CONSENSUS-G	-----
HIVPH153	-----	HIVLBV217	-----
HIVPH136	L-----	HIVVI191	LT-----
HIVBZ200	-----	HIVTAIG	-----
HIVTB132	-----	G_HIVJV831	-----
HIVBZ190	-----	CONSENSUS-H	-----
HIVLAI	-----	HIVVI525	-----
HIVHXB2R	-----	HIVVI557	-----
HIVMN	-----	CONSENSUS-O	-----
HIVJH31	-----	HIVANT70	-----
HIVJRCSF	-----	HIVMVP51	-----
HIVOYI	-----	CONSENSUS-CPZ	??-----
HIVNY5CG	-----	SIVCPZGAB	-----
HIVNL43	-----	SIVCPZANT	LT-----
HIVCDC41	-----	A?_HIVBZ126B	-----
HIVHAN	-----		
HIVCAM1	-----		
HIVRF	-----		
HIVD31	-----		

p24 CTL epitope 3**HLA-A2**

CONSENSUS-B	TLNAWVKVV
Epitope3	-----
CONSENSUS-A	-----I
HIVU455	-----
HIVMAL	-----I
HIVVI310	-----I
HIVVI57	-----I
HIVK112	-----I
HIVK88	-----I
HIVK29	-----I
HIVK124	-----I
HIVK98	-----I
HIVK89	-----I
HIVVI32	-----I
HIVVI415	-----I
HIVCI4	-----I
HIVG141	-----I
HIVLBV23	-----AI
HIVTN243	-----
HIVTN245	-----
HIVTN240	-----
HIVCI20	-----I
HIVCI59	-----I
HIVLBV2310	-----I
HIVCI51	-----AI
HIVLBV105	--D----I
HIVCI32	-----I
HIVIC144	-----I
HIVDJ258	-----I
HIVCM238	-----
HIVVI354	-----I
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-----I
HIVPH153	-----
HIVPH136	-----
HIVBZ200	-----
HIVTB132	-----
HIVBZ190	-----
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	-----
HIVJRCSF	-----I
HIVOYI	-----
HIVNY5CG	-----
HIVNL43	-----
HIVCDC41	-----I
HIVHAN	-----
HIVCAM1	-----
HIVRF	-----
HIVD31	-----
HIVBH102	-----

CONSENSUS-B	TLNAWVKVV
HIVPV22	-----
HIVJRFL	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-----I
HIVUG268	-----I
HIVSM145	-----I
HIVZAM18	-----I
HIVZAM19	-----I
HIVZAM20	-----I
HIVDJ259	-----I
HIVVI313	-----I
CONSENSUS-D	-----I
HIVELI	-----I
HIVZZ6	-----I
HIVNDK	-----I
HIVVI205	---E-I
HIVG109	-----I
HIVK31	-----I
HIVUG274	-----I
HIVUG270	-----I
HIVSE365	-----I
HIVVI203	-----I
CONSENSUS-F	-----I
HIVVI174	-----I
HIVVI69	-----I
HIVBZ162	-----I
HIVVI325	-----I
CONSENSUS-G	-----
HIVLBV217	-----
HIVVI191	-----I
HIVTAIG	-----
G_HIVJV831	-----
CONSENSUS-H	-----
HIVVI525	-----
HIVVI557	-----
CONSENSUS-O	-----A-
HIVANT'0	-----A-
HIVMVP51	-----A-
CONSENSUS-CPZ	-----?-
SIVCPZGAB	-----
SIVCPZANT	-----C-
A?_HIVBZ126B	-----

HIV CTL Epitopes

p24 CTL epitope 4

HLA-B14

CONSENSUS-B **DLNTMLNTV**
Epitope4 -----

CONSENSUS-A **---M---I-**
 HIVU455 ---M---V-
 HIVMAL ---M---I-
 HIVVI59 ---M---V-
 HIVVI310 ---M---I-
 HIVVI57 ---M---I-
 HIVK112 ---M---I-
 HIVK88 ---M---I-
 HIVK29 ---M---I-
 HIVK124 ---M---I-
 HIVK7 ---V---I-
 HIVK98 ---V---I-
 HIVK89 ---M---I-
 HIVVI32 ---M---I-
 HIVVI415 ---M---I-
 HIVCI4 ---M---I-
 HIVG141 ---M---I-
 HIVLBV23 ---M---I-
 HIVTN243 ---M---I-
 HIVTN245 ---M---I-
 HIVTN240 ---M---I-
 HIVCI20 ---M---I-
 HIVCI59 ---M---I-
 HIVLBV2310 ---M---I-
 HIVCI51 ---M---I-
 HIVLBV105 ---M---I-
 HIVCI32 -----
 HIVIC144 ---M---I-
 HIVDJ258 ---M---I-
 HIVCM238 ---M---I-
 HIVUG266 ---M---V-
 HIVVI354 N--I---I-

CONSENSUS-B -----
 HIVSF2 -----
 HIVBZ167 -----
 HIVPH153 -----
 HIVPH136 -----
 HIVBZ200 -----
 HIVTB132 -----
 HIVBZ190 -----
 HIVLAI -----
 HIVHXB2R -----
 HIVMN -----
 HIVJH31 -----
 HIVJRCSF -----
 HIVOYI -----
 HIVNY5CG -----
 HIVNL43 -----
 HIVCDC41 -----
 HIVHAN -----
 HIVCAM1 -----

CONSENSUS-B	DLNTMLNTV
HIVRF	-----
HIVD31	-----
HIVBH102	-----
HIVPV22	-----
HIVJRLF	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-----
HIVUG268	-----
HIVSM145	-----
HIVZAM18	-----
HIVZAM20	-----
HIVDJ259	-----
HIVVI313	-----
CONSENSUS-D	-----
HIVELI	-----
HIVZ2Z6	-----
HIVNDK	-----
HIVVI205	-----
HIVG109	-----A
HIVK31	-----
HIVUG274	-----
HIVUG270	---A---
HIVSE365	-----
HIVVI203	-----
CONSENSUS-F	-----
HIVVI174	-----
HIVVI69	-----
HIVBZ162	-----
HIVVI325	-----
CONSENSUS-G	-----
HIVLBV217	-----
HIVVI191	-----
G_HIVJV831	-----
CONSENSUS-H	---A---?-
HIVVI525	---A-----
HIVVI557	---A---I-
CONSENSUS-O	-I-----AI
HIVANT70	-I-----AI
HIVMVP51	-I-----AI
CONSENSUS-CPZ	-?-----A-
SIVCPZGAB	-V-----A-
SIVCPZANT	-----A-
A?_HIVBZ126B	-----

p24 CTL epitope 5**HLA-A2**

CONSENSUS-B **GHQAAMQMLKE**
Epitope5 -----

CONSENSUS-A -----D
 HIVU455 -----D
 HIVMAL -----D
 HIVVI59 -----D
 HIVVI310 -----D
 HIVVI57 -----D
 HIVK112 -----D
 HIVK88 -----D
 HIVK29 -----D
 HIVK124 -----N
 HIVK7 -----D
 HIVK98 -----D
 HIVK89 -----D
 HIVVI32 -----D
 HIVVI415 -----D
 HIVCI4 -----D
 HIVG141 -----D
 HIVLBV23 -----D
 HIVTN243 -----
 HIVTN245 -----
 HIVTN240 -----
 HIVCI20 -----D
 HIVCI59 -----D
 HIVLBV2310 -----D
 HIVCI51 -----D
 HIVLBV105 -----D
 HIVCI32 -----D
 HIVIC144 -----D
 HIVDJ258 -----D
 HIVCM238 -----
 HIVUG266 -----D
 HIVVI354 -----D

CONSENSUS-B -----
 HIVSF2 -----
 HIVBZ167 -----D
 HIVPH153 -----
 HIVPH136 -----
 HIVBZ200 -----
 HIVTB132 -----
 HIVBZ190 -----
 HIVLAI -----
 HIVHXB2R -----
 HIVMN -----
 HIVJH31 -----
 HIVJRCASF -----
 HIVYOI -----
 HIVNY5CG -----
 HIVNL43 -----
 HIVCDC41 -----
 HIVHAN -----
 HIVCAM1 -----

CONSENSUS-B	GHQAAMQMLKE
HIVRF	-----
HIVD31	-----
HIVBH102	-----
HIVPV22	-----
HIVJRFL	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-----D
HIVUG268	-----D
HIVSM145	-----D
HIVZAM18	-----D
HIVZAM20	-----D
HIVDJ259	-----D
HIVVI313	-----D
CONSENSUS-D	-----
HIVELI	-----
HIVZ2Z6	-----
HIVNDK	-----
HIVVI205	--H----
HIVG109	-----
HIVK31	-----
HIVUG274	-----
HIVUG270	-----
HIVSE365	-----
HIVVI203	-----
CONSENSUS-F	-----D
HIVVI174	-----D
HIVVI69	-----D
HIVBZ162	-----D
HIVVI325	-----D
CONSENSUS-G	-----D
HIVLBV217	-----D
HIVVI191	-----D
HIVTAIG	-----S-D
G_HIVJV831	-----D
CONSENSUS-H	-----?--D
HIVVI525	-----I--D
HIVVI557	-----D
CONSENSUS-O	---G-L-V---
HIVANT70	---G-L-V---
HIVMVP51	---G-L-V---
CONSENSUS-CPZ	?---G---V---
SIVCPZGAB	---G---V---
SIVCPZANT	D---G---V---
A?_HIVBZ126B	-----D

HIV CTL Epitopes

p24 CTL epitope 6

HLA-B57

CONSENSUS-B	TSTLQEIQIGW
Epitope6	-----
CONSENSUS-A	-----
HIVU455	---V-----
HIVMAL	-----
HIVVI310	-----
HIVVI57	---P-----
HIVK112	---P-----
HIVK88	---P-----
HIVK29	---P-----
HIVK124	---P-----
HIVK7	---P---LQ-
HIVK98	---P---LQ-
HIVK89	---P---L--
HIVVI32	---P-----
HIVVI415	---T---A-
HIVCI4	-----
HIVG141	-----
HIVLBV23	---A---Q-
HIVTN243	-----
HIVTN245	-----
HIVTN240	-----
HIVCI20	-----
HIVCI59	--N-----
HIVLBV2310	--N-----
HIVCI51	-----
HIVLBV105	-----
HIVCI32	-----A-
HIVDJ258	-----
HIVCM238	-----
HIVVI354	---T-----
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-----
HIVPH153	-----
HIVPH136	-----
HIVBZ200	-----
HIVTB132	-----
HIVBZ190	-----
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	-----
HIVJRCSF	-----
HIVOYI	-----
HIVNY5CG	-----
HIVNL43	-----
HIVCDC41	-----
HIVHAN	-----
HIVCAM1	-----
HIVRF	-----
HIVD31	-----
HIVBH102	-----

CONSENSUS-B	TSTLQEIQIGW
HIVPV22	-----
HIVJRFL	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-----A-
HIVUG268	-----N-
HIVSM145	-----A-
HIVZAM18	-----A-
HIVZAM19	-----A-
HIVZAM20	-----A-
HIVDJ259	--N----A-
HIVVI313	-----A-
CONSENSUS-D	-----?-
HIVELI	-----A-
HIVZ2Z6	-----A-
HIVNDK	-----A-
HIVVI205	-----A-
HIVG109	-----A-
HIVK31	-----
HIVUG274	-----
HIVUG270	--I---V--
HIVSE365	-----
HIVVI203	-----
CONSENSUS-F	-----Q-
HIVVI174	-----Q-
HIVVI69	-----Q-
HIVBZ162	-----Q-
HIVVI325	-----T-
CONSENSUS-G	-----R-
HIVLBV217	-----R-
HIVVI191	-----R-
HIVTAIG	-----R-
G_HIVJV831	-----R-
CONSENSUS-H	-----A-
HIVVI525	-----A-
HIVVI557	-----A-
CONSENSUS-O	---Q----?-
HIVANT70	---Q---H-
HIVMVP51	---Q---I-
CONSENSUS-CPZ	---?---??-
SIVCPZGAB	-----
SIVCPZANT	---V---MQ-
A?_HIVBZ126B	-----

p24 CTL epitope 7**HLA-B35**

CONSENSUS-B	PPIPVGEIY
Epitope7	-----D--
Alt form	-----
CONSENSUS-A	-----D--
HIVU455	-----D--
HIVMAL	-----D--
HIVVI59	-----D--
HIVVI310	--V-----
HIVVI57	-----D--
HIVK112	-----D--
HIVK88	-----D--
HIVK29	-----D--
HIVK124	-----D--
HIVK7	-----D--
HIVK98	-----D--
HIVK89	-----D--
HIVVI32	-----D--
HIVVI415	--N---D--
HIVCI4	--V-----
HIVG141	-----
HIVLBV23	-----D--
HIVTN243	-----D--
HIVTN245	-----D--
HIVTN240	-----D--
HIVCI20	--V-----
HIVCI59	-----
HIVLBV2310	-----
HIVCI51	--T-----
HIVLBV105	--V---D--
HIVCI32	-----
HIVIC144	-----
HIVDJ258	-----D--
HIVCM238	-----D--
HIVUG266	-----
HIVVI354	-----K--
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-----K--
HIVPH153	-----
HIVPH136	-----
HIVBZ200	-----
HIVTB132	-----
HIVBZ190	-----
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	-----
HIVJRCASF	-----
HIVOYI	-----
HIVNY5CG	-----
HIVNL43	-----
HIVCDC41	--T-----
HIVHAN	-----
HIVCAM1	-----
HIVRF	-----

CONSENSUS-B	PPIPVGEIY
HIVD31	-----
HIVBH102	-----
HIVPV22	-----
HIVJRLF	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-----D--
HIVUG268	-----
HIVSM145	-----D--
HIVZAM18	--V---D--
HIVZAM19	--V---D--
HIVZAM20	--V-----
HIVDJ259	-----D--
HIVVI313	-----D--
CONSENSUS-D	-----
HIVELI	-----
HIVZ2Z6	-----
HIVNDK	-----
HIVVI205	-----KK--
HIVG109	-----
HIVK31	-----
HIVUG274	-----
HIVUG270	-----
HIVSE365	-----
HIVVI203	-----
CONSENSUS-F	--V-----
HIVVI174	--V-----
HIVVI69	-----D--
HIVBZ162	--V-----
HIVVI325	--V-----
CONSENSUS-G	-----
HIVLBV217	-----
HIVVI191	-----D--
HIVTAIG	-----
G_HIVJV831	-----
CONSENSUS-H	-?----D--
HIVVI525	-A----D--
HIVVI557	-----D--
CONSENSUS-O	?----D--
HIVANT70	Q----D--
HIVMVP51	.S----D--
CONSENSUS-CPZ	???---D?-
SIVCPZGAB	-----DV-
SIVCPZANT	GGV---D--
A?_HIVBZ126B	-----

HIV CTL Epitopes

p24 CTL epitope 8

HLA-B8

CONSENSUS-B	GEIYKRWII
Epitope8	-----
Antagonist?	-D-----
CONSENSUS-A	-D-----
HIVU455	-D--R---
HIVMAL	-D-----
HIVVI59	-D--R---
HIVVI310	-----
HIVVI57	-D-----
HIVK112	-D-----
HIVK88	-D-----
HIVK29	-D-----
HIVK124	-D-----
HIVK7	-D-----
HIVK98	-D-----
HIVK89	-D-----
HIVVI32	-D-----
HIVVI415	-D-----
HIVCI4	----R---
HIVG141	-----
HIVLBV23	-D--RK--
HIVTN243	-D-----
HIVTN245	-D-----
HIVTN240	-D-----
HIVCI20	-----V
HIVCI59	-----V
HIVLBV2310	-----V
HIVCI51	----K--
HIVLBV105	-D-----
HIVCI32	-----
HIVIC144	-----V
HIVDJ258	-D-----
HIVCM238	-D-----
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-K-----
HIVPH153	-----
HIVPH136	-----
HIVTB132	-----
HIVBZ190	-----
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	-----
HIVJRCSF	-----
HIVOYI	-----
HIVNY5CG	-----
HIVNL43	-----
HIVCDC41	-----
HIVHAN	-----
HIVCAM1	-----
HIVRF	-----
HIVD31	-----

CONSENSUS-B	GEIYKRWII
HIVBH102	-----
HIVPV22	-----
HIVJRLF	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-D-----
HIVUG268	-----
HIVSM145	-D-----
HIVZAM18	-D-----
HIVZAM19	-D-----
HIVZAM20	-----
HIVDJ259	-D-----
HIVVI313	-D-----
CONSENSUS-D	-----
HIVELI	-----
HIVZ2Z6	-----
HIVNDK	-----
HIVVI205	KK-----
HIVG109	-----K--
HIVK31	-----
HIVUG274	-----
HIVUG270	-----
HIVSE365	-----
HIVVI203	-----
CONSENSUS-F	-----
HIVVI174	-----
HIVVI69	-D-----
HIVBZ162	-----
HIVVI325	-----
CONSENSUS-G	-----
HIVLBV217	-----
HIVVI191	-D-----
HIVTAIG	-----
G_HIVJV831	-----
CONSENSUS-H	-D-----
HIVVI525	-D-----
HIVVI557	-D-----
CONSENSUS-O	-D--RK--V
HIVANT70	-D--RK--V
HIVMVP51	-D--RK--V
CONSENSUS-CPZ	-D?-?---?-
SIVCPZGAB	-DV-R--V-
SIVCPZANT	-D-----
A? <u>_HIVBZ126B</u>	-----

p24 CTL epitope 9

HLA-B27

CONSENSUS-B	KRWIIILGLNK
Epitope9	-----
Alt form	-----M-.-
Alt form2	-----.
 CONSENSUS-A	 -----
HIVU455	R-----
HIVMAL	-----
HIVVI159	R-----
HIVVI310	-----
HIVVI157	-----
HIVK112	-----
HIVK88	-----
HIVK29	-----
HIVK124	-----
HIVK7	-----
HIVK98	-----
HIVK89	-----
HIVVI32	-----
HIVVI415	-----
HIVCI4	R-----
HIVG141	-----
HIVLBV23	RK-----
HIVTN243	-----
HIVTN245	-----
HIVTN240	-----
HIVCI20	---V---
HIVCI59	---V---
HIVLBV2310	---V---
HIVCI51	-K-----
HIVLBV105	-----
HIVCI32	-----
HIVIC144	---V---
HIVDJ258	-----
HIVCM238	-----
 CONSENSUS-B	 -----
HIVSF2	-----
HIVBZ167	-----
HIVPH153	-----
HIVPH136	----M--
HIVTB132	-----
HIVBZ190	----M--
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	-----
HIVJRCASF	-----
HIVOYI	-----
HIVNY5CG	-----
HIVNL43	-----
HIVCDC41	-----
HIVHAN	-----
HIVCAM1	-----
HIVRF	-----
HIVD31	-----

CONSENSUS-B	KRWIILGLNK
HIVBH102	-----
HIVPV22	-----
HIVJRLF	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-----
HIVUG268	-----
HIVSM145	-----
HIVZAM18	-----
HIVZAM19	-----
HIVZAM20	-----
HIVDJ259	-----
HIVVI313	-----
CONSENSUS-D	-----
HIVELI	-V-----
HIVZ2Z6	-----
HIVNDK	-----
HIVVI205	-----
HIVG109	-K---M----
HIVK31	-----
HIVUG274	-----
HIVUG270	-----
HIVSE365	-----
HIVVI203	-----
CONSENSUS-F	-----
HIVVI174	-----
HIVVI69	-----
HIVBZ162	-----
HIVVI325	-----
CONSENSUS-G	-----
HIVLBV217	-----
HIVVI191	-----
HIVTAIG	-----
G_HIVJV831	-----
CONSENSUS-H	-----
HIVVI525	-----
HIVVI557	-----
CONSENSUS-O	RK--V-----
HIVANT70	RK--V-----
HIVMVP51	RK--V-----
CONSENSUS-CPZ	?--?--?-----
SIVCPZGAB	R--V-----
SIVCPZANT	-----M-----
A?_HIVBZ126B	-----

HIV CTL Epitopes

p24 CTL epitope 10

HLA-A33, HLA-B27

CONSENSUS-B	KRWIILGLNKIVRMY	CONSENSUS-B	KRWIILGLNKIVRMY
Epitope10	-----	HIVPV22	-----
CONSENSUS-A	-----	HIVJRLF	-----
HIVU455	R-----	HIVUG280	-----
HIVMAL	-----	HIVYU2	-----
HIVVI59	R-----	HIVBCSG3C	-----
HIVVI310	-----	B_HIVMANC	-----
HIVVI57	-----	B_HIV1U29413	-----
HIVK112	-----	B_HIV1U29404	-----
HIVK88	-----	B_HIV1U29255	-----
HIVK29	-----	B_HIV1U29246	-----
HIVK124	-----	CONSENSUS-C	-----
HIVK7	-----	HIVUG268	-----
HIVK98	-----	HIVSM145	-----
HIVK89	-----	HIVZAM18	-----
HIVVI32	-----	HIVZAM19	-----
HIVVI415	-----	HIVZAM20	-----
HIVCI4	R-----	HIVDJ259	-----
HIVG141	-----	HIVVI313	-----
HIVLBV23	RK-----	CONSENSUS-D	-----
HIVTN243	-----	HIVELI	V-----
HIVTN245	-----	HIVZ2Z6	-----
HIVTN240	-----	HIVNDK	-----
HIVCI20	---V---	HIVVI205	K--
HIVCI59	---V---	HIVG109	-K---M-----
HIVLBV2310	---V---	HIVK31	-----
HIVCI51	-K-----	HIVUG274	-----
HIVLBV105	-----	HIVUG270	-----
HIVCI32	-----	HIVSE365	-----
HIVIC144	---V-----	HIVVI203	-----
HIVDJ258	-----	CONSENSUS-F	-----
HIVCM238	-----	HIVVI174	-----
CONSENSUS-B	-----	HIVVI69	-----
HIVSF2	-----	HIVBZ162	-----
HIVBZ167	-----	HIVVI325	-----
HIVPH153	-----	CONSENSUS-G	-----
HIVPH136	---M-----	HIVLBV217	-----
HIVTB132	-----	HIVVI191	-----
HIVBZ190	---M-----	HIVTAIG	-----
HIVLAI	-----	G_HIVJV831	-----
HIVHXB2R	-----	CONSENSUS-H	-----
HIVMN	-----	HIVVI525	-----
HIVJH31	-----	HIVVI557	-----
HIVJRCSF	-----	CONSENSUS-O	RK--V-----M-K--
HIVOYI	-----	HIVANT70	RK--V-----M-K--
HIVNY5CG	-----	HIVMVP51	RK--V-----M-K--
HIVNL43	-----	CONSENSUS-CPZ	?---?---V---?-
HIVCDC41	-----	SIVCPZGAB	R--V-----V---
HIVHAN	-----	A?_HIVBZ126B	-----
HIVCAM1	-----		
HIVRF	-----		
HIVD31	-----		
HIVBH102	-----		

p24 CTL epitope 11
HLA-Bw62

CONSENSUS-B	LGLNKIVRMY
Epitope11	-----
CONSENSUS-A	-----
HIVU455	-----
HIVMAL	-----
HIVVI59	-----
HIVVI310	-----
HIVVI57	-----
HIVK112	-----
HIVK88	-----
HIVK29	-----
HIVK124	-----
HIVK7	-----
HIVK98	-----
HIVK89	-----
HIVVI32	-----
HIVVI415	-----
HIVCI4	-----
HIVG141	-----
HIVLBV23	-----
HIVTN243	-----
HIVTN245	-----
HIVTN240	-----
HIVCI120	-----
HIVCI159	-----
HIVLBV2310	-----
HIVCI51	-----
HIVLBV105	-----
HIVCI32	-----
HIVIC144	-----
HIVDJ258	-----
HIVCM238	-----
HIVUG266	-----
HIVVI354	-----
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-----
HIVPH153	-----
HIVPH136	M-----
HIVBZ200	-----
HIVTB132	-----
HIVBZ190	M-----
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	-----
HIVJRCNF	-----
HIVOYI	-----
HIVNY5CG	-----
HIVNL43	-----
HIVCDC41	-----
HIVHAN	-----
HIVCAM1	-----
HIVRF	-----

CONSENSUS-B	LGLNKIVRMY
HIVD31	-----
HIVBH102	-----
HIVPV22	-----
HIVJRLF	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-----
HIVUG268	-----
HIVSM145	-----
HIVZAM18	-----
HIVZAM19	-----
HIVZAM20	-----
HIVDJ259	-----
HIVVI313	-----
CONSENSUS-D	-----
HIVELI	V-----
HIVZ2Z6	-----
HIVNDK	-----
HIVVI205	-----K--
HIVG109	M-----
HIVK31	-----
HIVUG274	-----
HIVUG270	-----
HIVSE365	-----
HIVVI203	-----
CONSENSUS-F	-----
HIVVI174	-----
HIVVI69	-----
HIVBZ162	-----
HIVVI325	-----
CONSENSUS-G	-----
HIVLBV217	-----
HIVVI191	-----
HIVTAIG	-----
G_HIVJV831	-----
CONSENSUS-H	-----
HIVVI525	-----
HIVVI557	-----
CONSENSUS-O	-----M-K--
HIVANT70	-----M-K--
HIVMVP51	-----M-K--
CONSENSUS-CPZ	?----V---?-
SIVCPZGAB	-----V----
A?_HIVBZ126B	-----

HIV CTL Epitopes

p24 CTL epitope 12

HLA-B14

CONSENSUS-B	DRFYKTLRA
Epitope12	---W----
CONSENSUS-A	---F-----
HIVU455	---F-----
HIVMAL	---F-----
HIVVI159	---F-I---
HIVVI310	---F-----
HIVVI57	---F-V---
HIVK112	---F-----
HIVK88	---F-----
HIVK29	---F-----
HIVK124	---F-----
HIVK7	---F-A---
HIVK98	---F-A---
HIVK89	---F-----
HIVVI32	---F-----
HIVVI415	---F-I---
HIVCI4	---F-C---
HIVG141	---F-----
HIVLBV23	---F-----
HIVTN243	-----
HIVTN245	-----
HIVTN240	-----
HIVCI20	---F-----
HIVCI59	---F-----
HIVLBV2310	---F-V--
HIVCI51	---F-----
HIVLBV105	---F-----
HIVCI32	-----
HIVIC144	---F-----
HIVDJ258	---F-----
HIVCM238	-----
HIVUG266	-K-F-----
HIVVI354	N--F-----
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-----
HIVPH153	-----
HIVPH136	-----
HIVBZ200	-----
HIVTB132	-----
HIVBZ190	-----
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	-----
HIVJRCSF	-----
HIVOYI	-----
HIVNY5CG	-----
HIVNL43	-----
HIVCDC41	-----
HIVHAN	-----
HIVCAM1	-----

CONSENSUS-B	DRFYKTLRA
HIVRF	-----
HIVD31	-----
HIVBH102	-----
HIVPV22	-----
HIVJRLF	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	---F-----
HIVUG268	---F-----
HIVSM145	---F-----
HIVZAM18	---F-----
HIVZAM19	---F-----
HIVZAM20	---F-----
HIVDJ259	---F-----
HIVVI313	---F-----
CONSENSUS-D	-----
HIVELI	-----
HIVZ2Z6	-----
HIVNDK	-----
HIVVI205	-----
HIVG109	-----
HIVK31	-----
HIVUG274	-----
HIVUG270	-----
HIVSE365	-----
HIVVI203	-----
CONSENSUS-F	---F-----
HIVVI174	---F-----
HIVVI69	---F-----
HIVBZ162	---F-----
HIVVI325	---F-----
CONSENSUS-G	---F-----
HIVLBV217	---F-----
HIVVI191	---F-----
CONSENSUS-H	---F-?---
HIVVI525	---F-----
HIVVI557	---F-A---
CONSENSUS-O	-----
HIVANT70	-----
HIVMVP51	-----
CONSENSUS-CPZ	-----?--
SIVCPZGAB	-----
SIVCPZANT	-----I--
A? <u>_HIVBZ126B</u>	---F-----

p24 CTL epitope 13
HLA-Cw8

CONSENSUS-B	RAEQASQEVK
Epitope13	-----
CONSENSUS-A	-----T----
HIVU455	-----T-D--
HIVMAL	-----T----
HIVVI59	-----T----
HIVVI310	-----T-A--
HIVVI57	-----D--
HIVK112	-----T----
HIVK88	-----T----
HIVK29	-----T----
HIVK124	-----T----
HIVK7	-----D--
HIVK98	-----T----
HIVK89	-----T-D--
HIVVI32	-----T----
HIVVI415	-----T----
HIVCI4	-----T----
HIVG141	-----T----
HIVLBV23	-----T-D--
HIVTN243	-----T----
HIVTN245	-----T----
HIVTN240	-----T----
HIVCI120	-----T----
HIVLBV2310	-----T----
HIVCI151	-----T----
HIVLBV105	-----T-D--
HIVCI132	-----
HIVIC144	-----
HIVDJ258	-----T----
HIVCM238	-----T----
HIVUG266	-----T-D--
HIVVI354	--K---T----
CONSENSUS-B	-----
HIVSF2	-----D--
HIVBZ167	-----D--
HIVPH153	-----D--
HIVPH136	-----
HIVBZ200	-----
HIVTB132	-----
HIVBZ190	-----
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	-----
HIVJRCSF	-----T-
HIVOYI	-----D--
HIVNY5CG	-----
HIVNL43	-----
HIVCDC41	-----
HIVHAN	-----T----
HIVCAM1	-----
HIVRF	-----D--

CONSENSUS-B	RAEQASQEVK
HIVD31	-----T----
HIVBH102	-----
HIVPV22	-----
HIVJRFL	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----D--
B_HIV1U29246	-----
CONSENSUS-C	-----T-D--
HIVUG268	-----T-D--
HIVSM145	-----T-D--
HIVZAM18	-----T-D--
HIVZAM19	-----T-D--
HIVZAM20	-----T-D--
HIVDJ259	-----D--
HIVVI313	-----T-D--
CONSENSUS-D	-----D--
HIVELI	-----D--
HIVZ2Z6	-----
HIVNDK	-----D--
HIVVI205	-----D--
HIVG109	-----D--
HIVK31	-----D--
HIVUG274	-----D--
HIVUG270	-----D--
HIVSE365	-----T----
HIVVI203	-----T----
CONSENSUS-F	-----T----
HIVVI174	-----T----
HIVVI169	---E-T---
HIVBZ162	-----T----
HIVVI325	-----T----
CONSENSUS-G	-----T-?--
HIVLBV217	-----T-D--
HIVVI191	-----T----
CONSENSUS-H	-----T-?--
HIVVI525	-----T-D--
HIVVI557	-----T----
CONSENSUS-O	-----T----
HIVANT'0	-----T----
HIVMVP51	-----T----
CONSENSUS-CPZ	-----?--
SIVCPZGAB	-----
SIVCPZANT	-----P--
A?_HIVBZ126B	-----T----

HIV CTL Epitopes

p24 CTL epitope 14

HLA-B8

CONSENSUS-B **DCKTILKAL**
Epitope14

CONSENSUS-A **---S---R--**
HIVU455 ---S---R--
HIVMAL -----
HIVVI159 ---S---R-
HIVVI310 ---S-----
HIVVI57 ---S---R--
HIVK112 ---S---RG-
HIVK88 ---S---R--
HIVK29 ---S---R--
HIVK124 ---S---R--
HIVK7 ---S-----
HIVK98 ---S-----
HIVK89 ---S---R--
HIVVI32 ---S---R--
HIVVI415 -----R--
HIVCI4 ---S---R--
HIVG141 -----R--
HIVLBV23 -----R--
HIVTN243 ---S-----
HIVTN245 ---S-----
HIVTN240 ---S-----
HIVCI20 ---S---R--
HIVCI59 ---S---R--
HIVLBV2310 ---S---R--
HIVCI51 ---S---R--
HIVLBV105 -----R--
HIVCI32 ---S-----
HIVIC144 -----R--
HIVDJ258 ---S---R--
HIVCM238 ---S-----
HIVUG266 ---S---R--
HIVVI354 -----RG-

CONSENSUS-B **-----**
HIVSF2 -----
HIVBZ167 -----
HIVPH153 -----
HIVPH136 -----
HIVBZ200 -----
HIVTB132 -----
HIVBZ190 -----
HIVLAI -----
HIVHXB2R -----
HIVMN -----
HIVJH31 -----
HIVJRCSF -----
HIVOYI -----
HIVNY5CG -----
HIVNL43 -----
HIVCDC41 -----
HIVHAN -----
HIVCAM1 -----

CONSENSUS-B	DCKTILKAL
HIVRF	-----
HIVD31	-----
HIVBH102	-----
HIVPV22	-----
HIVJRLF	-----
HIVUG280	-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-----R--
HIVUG268	-----R--
HIVSM145	-----R--
HIVZAM18	-----R--
HIVZAM19	-----R--
HIVZAM20	-----R--
HIVDJ259	-----R--
HIVVI313	-----R--
CONSENSUS-D	-----
HIVELI	-----
HIVZ2Z6	-----
HIVNDK	-----
HIVVI205	-----
HIVG109	-----
HIVK31	-----
HIVUG274	--R-----
HIVUG270	-----
HIVSE365	---N-----
HIVVI203	-----
CONSENSUS-F	-----
HIVVI174	-----
HIVVI69	-----M
HIVBZ162	-----
HIVVI325	-----
CONSENSUS-G	-----?--
HIVLBV217	-----
HIVVI191	-----R--
CONSENSUS-H	---?---?--
HIVVI525	---N-----
HIVVI557	-----R--
CONSENSUS-O	---Q---?-
HIVANT70	---Q---S-
HIVMVP51	---Q-----
CONSENSUS-CPZ	---?-----
SIVCPZGAB	---Q-----
SIVCPZANT	---H-----
A?_HIVBZ126B	---S---R--

p24 CTL epitope 15
HLA-B51

CONSENSUS-B	Q NAN P D C K T I L K
Epitope15	-----
CONSENSUS-A	-----S--R
HIVU455	-----S--R
HIVMAL	-----
HIVVI59	-----S---
HIVVI310	-----S---
HIVVI57	-----S--R
HIVK112	-----S--R
HIVK88	-----S--R
HIVK29	-----S--R
HIVK124	-----S--R
HIVK7	-----S---
HIVK98	-----S---
HIVK89	-----S--R
HIVVI32	-----S--R
HIVVI415	-----R
HIVCI4	-----S--R
HIVG141	-----R
HIVLBV23	-----R
HIVTN243	-----S---
HIVTN245	-----S---
HIVTN240	-----S---
HIVCI120	-----S--R
HIVCI159	-----S--R
HIVLBV2310	-----S--R
HIVCI151	-----S--R
HIVLBV105	-----R
HIVCI132	-----S---
HIVIC144	-----R
HIVDJ258	-----S--R
HIVCM238	-----S---
HIVUG266	-----S--R
HIVVI354	-----R
CONSENSUS-B	-----
HIVSF2	-----
HIVBZ167	-----
HIVPH153	-----
HIVPH136	-----
HIVBZ200	-----
HIVTB132	P-----
HIVBZ190	--S-----
HIVLAI	-----
HIVHXB2R	-----
HIVMN	-----
HIVJH31	-----
HIVJRCSF	-----
HIVOYI	-----
HIVNY5CG	-----
HIVNL43	-----
HIVCDC41	-----
HIVHAN	-----
HIVCAM1	-----

CONSENSUS-B	Q NAN P D C K T I L K
HIVRF	-----
HIVD31	-----
HIVBH102	-----
HIVPV22	-----
HIVJRFL	-----
HIVUG280	--S-----
HIVYU2	-----
HIVBCSG3C	-----
B_HIVMANC	-----
B_HIV1U29413	-----
B_HIV1U29404	-----
B_HIV1U29255	-----
B_HIV1U29246	-----
CONSENSUS-C	-----R
HIVUG268	-----R
HIVSM145	-----R
HIVZAM18	-----R
HIVZAM19	-----R
HIVZAM20	-----R
HIVDJ259	-----R
HIVVI313	-----R
CONSENSUS-D	-----
HIVELI	-----
HIVZZ6	-----
HIVNDK	-----
HIVVI205	-----
HIVG109	-----
HIVK31	-----
HIVUG274	-----R---
HIVUG270	-----
HIVSE365	-----N--
HIVVI203	-----
CONSENSUS-F	-----
HIVVI174	-----
HIVVI69	-----
HIVBZ162	-----
HIVVI325	-----
CONSENSUS-G	-----?
HIVLBV217	-----
HIVVI191	-----R
CONSENSUS-H	-----?--?
HIVVI525	-----N---
HIVVI557	-----R
CONSENSUS-O	--?-----Q---
HIVANT'0	-----Q---
HIVMVP51	--S-----Q---
CONSENSUS-CPZ	-----?---
SIVCPZGAB	-----Q---
SIVCPZANT	-----H---
A?_HIVBZ126B	-----S--R

HIV CTL Epitopes

**I-42
NOV 95**

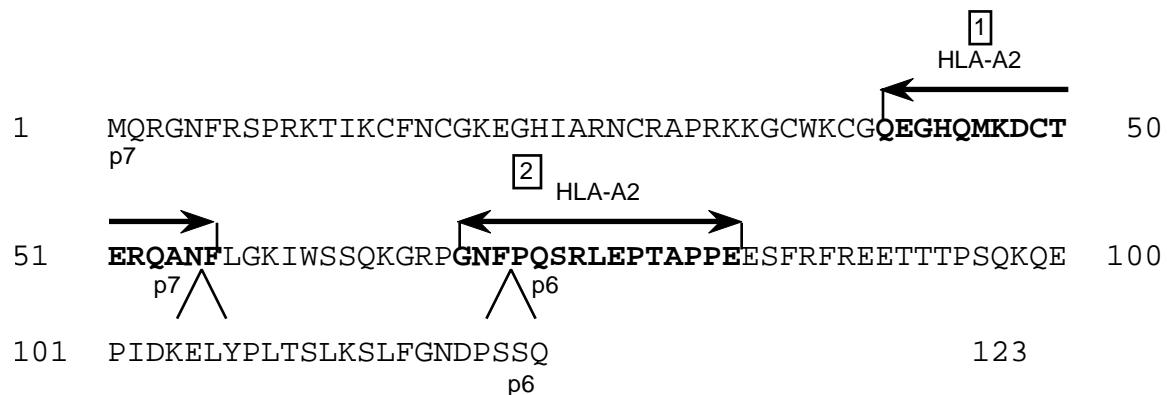
p15 CTL Epitopes

CTL p15 Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
p15(418-433 BRU)	GNFLQSRPEPTAPPF 1 of 4 epitopes predicted then shown to stimulate HLA-A2 restricted CTL line	HIV-1 infection	human(A2)	[Claverie (1988)]
p15(446-460 BRU)	KEGHQMKDCTERQANF 1 of 4 epitopes predicted then shown to stimulate HLA-A2 restricted CTL line	HIV-1 infection	human(A2)	[Claverie (1988)]

I-44
NOV95

p15 (p7-p6) CTL-EPITOPES



HIV CTL Epitopes

Epitopes and protein variability:

This plot shows a score that is a measure of variability for each position in the p15 protein alignment, and the relative positions of regions with defined CTL epitopes as seen on the CTL epitope map. The solid lines are positions where the most common character in a p15 protein alignment is an amino acid; the dashed lines represent regions where the most common character is an insertion (dash) incorporated to maintain the alignments. The alignment used corresponds to the 1995 p15 protein alignment, publically available at the Human Retroviruses and AIDS database, totaling 82 sequences. See the "how to use the CTL section" information for more details on the variability measure. The higher scores indicate more variation; 0 is perfectly conserved. The different protein alignments (gp120, gp41, p24, p15, p17, Nef and RT) used to create these plots contain different sets of sequences; therefore each plot is internally consistent, but cannot be compared to other protein plots.

Most common amino acid in each position in the p15 protein is shown below. The numbering corresponds to the numbering in the variability plot for the p15 protein.

P15 CONSENSUS:

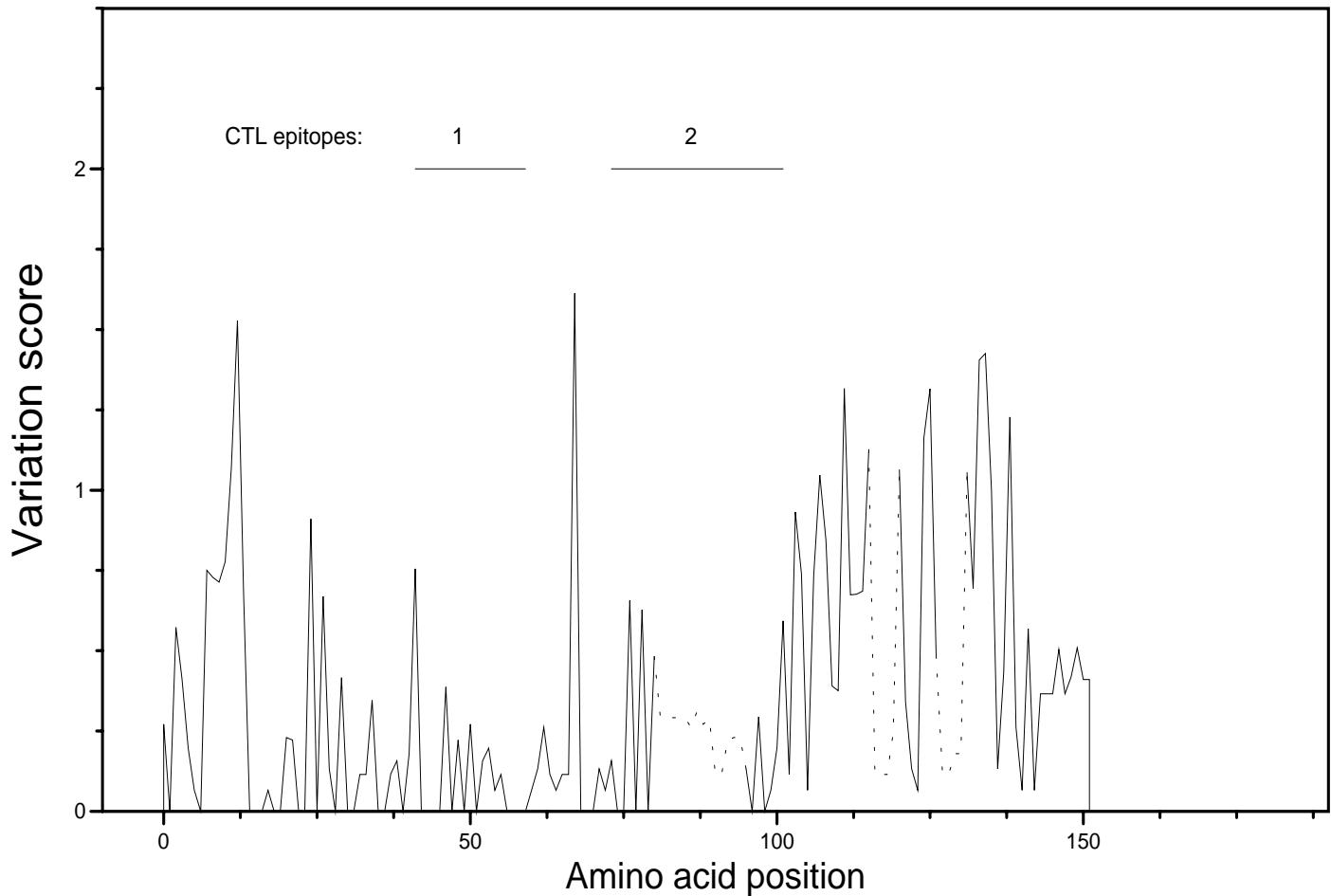
MQRGNF-KGQRKIIKCFNCGKEGHLARNCRAPRKKGCKCGKEGHQMKDC 50

T--E-RQANFLGKIWPSHKG-RPGNFLQSRP-----EPTAP 100

PAESF-GFGEEIT-PS---QKQEPKD---KELY-PLASLKSLFGNDPS 150

SQ

Variation in positions in the p15 protein



HIV CTL Epitopes

p15 CTL epitope 1

HLA-A2

CONSENSUS-B	KEGHQMKDCT.E.RQANF
Epitope1	-----.-.-----
CONSENSUS-A	-----.-.-----
HIVU455	-----.-.-----
HIVMAL	-----.-.-----
HIVVI59	-----.-.-----
HIVVI310	N-----.-.-----
HIVVI57	-----.-.-----
HIVK112	-----.-.-----
HIVK88	-----.-.G-----
HIVK29	-----.-.D-----
HIVK124	R-----.-.-----
HIVK7	----L---.-.-----
HIVK98	-----.-.-----
HIVK89	----E---.-.-----
HIVVI32	-----N.-.-----
HIVVI415	-----.-.-----
HIVCI4	-----.-.-----
HIVG141	-----.-.-----
HIVLBV23	-----.-.-----
HIVTN243	R-----.-.-----
HIVTN245	-----.-.-----
HIVTN240	-----.-.-----
HIVCI20	-----.-.-----
HIVCI59	-----.-.-----
HIVLBV2310	-----.-.-----
HIVCI51	R-----.-.-----
HIVLBV105	-----.-.-----
HIVCI32	-----.-.-----
HIVCI144	-----.-.-----
HIVDJ258	-----.-.-----
HIVCM238	-----.-.-----
HIVUG266	----I---.-.-----
HIVVI354	----I-N--.K.-.-----
CONSENSUS-B	-----.-.-----
HIVSF2	R-----.-.-----
HIVBZ167	-----S.-.-----
HIVPH153	R-----.-.-----
HIVPH136	R-----.-.-----
HIVBZ200	R-----.-.-----
HIVTB132	-----.-.-----
HIVBZ190	-----S.-.-----
HIVLAI	-----.-.-----
HIVHXB2R	-----.-.-----
HIVMN	-----.-.-----
HIVJH31	-----N.-.-----
HIVJRCSF	-----E---.-.-----
HIVOYI	R-----.-.-----
HIVNY5CG	-----.-.-----
HIVNL43	-----.-.-----
HIVCDC41	R-----.-.-----
HIVHAN	-----.-.-----
HIVCAM1	-----N.-.-----

CONSENSUS-B

KEGHQMKDCT.E.RQANF

-----N.-G-----

-----.-.-----

-----.-.-----

-----.-.-----

-----NN.-.-----

-----.-.-----

-----.-.-----

-----.-.-----

-----I-----.-.-----

Q-----E-P.G.-.-----

CONSENSUS-C

?-----.-.-----

R-----.-.-----

HIVUG268

-----.-.-----

HIVSM145

-----.-.-----

HIVZAM18

-----.-.-----

HIVZAM20

-----.-.-----

HIVDJ259

-----.-.-----

HIVVI313

CONSENSUS-D

-----.-.-----

HIVELI

-----L-----.-.-----

HIVZ2Z6

-----L-----.-.-----

HIVNDK

-----.-.-----

HIVVI205

-----I-----.-.-----

HIVG109

-----.-.-----

HIVK31

-----.-.-----

HIVUG274

-----E-----.-.-----

HIVUG270

-----I-----.-.-----

HIVSE365

Q-----G-----

HIVVI203

CONSENSUS-F

R-----.-.-----

HIVVI174

-----.-.-----

HIVVI69

-----.-.-----

HIVBZ162

R-----.-.G-----

HIVVI325

-----.-.-----

CONSENSUS-G

?-----.-.-----

HIVLBV217

-----.-.-----

HIVVI191

R-----.-.-----

CONSENSUS-H

?----?-----.-.-----

HIVVI525

R-----.-.-----

HIVVI557

-----L-----.-.-----

CONSENSUS-O

Q-----? .NG?-----

HIVANT70

Q-----R.NGK-----

HIVMVP51

Q-----K.NG-----

CONSENSUS-CPZ

Q----?--?----?????V--

SIVCPZGAB

Q-----G.--V--

SIVCPZANT

Q---L-N-PATNTGKVN

A?_HIVBZ126B

-----.-.-----

p15 CTL epitope 2**HLA-A2**

CONSENSUS-B	GNFLQSRP..EPTAPPE
Epitope2	-----F
CONSENSUS-A	---P-----A
HIVU455	---P-----A
HIVMAL	-----A
HIVVI59	---P-----A
HIVVI310	---P-N-L-----A
HIVVI57	---P-----A
HIVK112	---P-N-L-----A
HIVK88	---P-N-L-----A
HIVK29	---P-N-L-----A
HIVK124	-----A
HIVK7	---P-----A
HIVK98	---P-----A
HIVK89	---P-N-L-----A
HIVVI32	---P-----S---A
HIVVI415	---P-----A
HIVCI4	---P-----A
HIVG141	---P-----S---A
HIVLBV23	---P-----A
HIVTN243	---P-----A
HIVTN245	---P-----A
HIVTN240	---P-----A
HIVCI120	---P-----A
HIVCI159	---P-G-----A
HIVLBV2310	---P-----A
HIVCI151	---P-----A
HIVLBV105	----T---S---A
HIVCI132	---P-----A
HIVIC144	R--P---T-----A
HIVDJ258	---P-----LA
HIVCM238	---P-----A
HIVUG266	R--P-----A
HIVVI354	----N---A
CONSENSUS-B	-----.
HIVSF2	-----.
HIVBZ167	-----.
HIVPH153	-----.
HIVPH136	-----.
HIVBZ200	----N---A
HIVTB132	-----A
HIVBZ190	-----.
HIVLAI	-----F
HIVHXB2R	-----.
HIVMN	R--P---T-----
HIVJH31	-----.
HIVJRCSE	-----.
HIVOYI	----N---A
HIVNY5CG	-----.
HIVNL43	-----.
HIVCDC41	-----.
HIVHAN	-----.
HIVCAM1	-----.

CONSENSUS-B	GNFLQSRP..EPTAPPE
HIVRF	-----.
HIVD31	-----R-----
HIVBH102	-----F
HIVPV22	-----.
HIVJRFL	-----.
HIVUG280	-----.
HIVYU2	-----S
HIVBCSG3C	--P---L..
B_HIVMANC	-----.
B_HIV1U29413	-----S
B_HIV1U29404	-----.
B_HIV1U29255	-----N
B_HIV1U29246	-----.
CONSENSUS-C	-----A
HIVUG268	-----A
HIVSM145	-----N-----A
HIVZAM18	-----RP
HIVZAM20	-----N-----A
HIVDJ259	-----.
HIVVI313	-----N-----A
CONSENSUS-D	-----A
HIVELI	-----.
HIVZ2Z6	-----.
HIVNDK	-----.
HIVVI205	-----.
HIVG109	-----.
HIVK31	-----.
HIVUG274	----L-----A
HIVUG270	-----.
HIVSE365	--P-----A
HIVVI203	-----.
CONSENSUS-F	-----A
HIVVI174	-----.
HIVVI69	-----S---A
HIVBZ162	-----N-----A
HIVVI325	-----.
CONSENSUS-G	-----?-----A
HIVLBV217	-----N---S---A
HIVVI191	-----I-T-----A
CONSENSUS-H	-----A
HIVVI525	-----.
HIVVI557	-----.
CONSENSUS-O	--YV-???..?-S---M
HIVANT'0	--YV-RPA..H-S---M
HIVMVP51	--YV-KQV..S-S---M
CONSENSUS-CPZ	---V-????-----I
SIVCPZGAB	--V-N-T..-----I
SIVCPZANT	--V-KEEVV-----I
A?_HIVBZ126B	-----N-----A

HIV CTL Epitopes

**I-50
NOV 95**

RT CTL Epitopes

CTL RT Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
RT(160-184 HXB2)	IETVPVKLPGMDGPKVKQWPLTEE One of five epitopes defined for RT specific CTL clones	HIV-1 infection	human(B8)	[Walker (1989)]
RT(185-193 LAI)	GPKVKQWPL		human(B8)	[Sutton (1993)]
RT(205-219 BRU)	Predicted epitope based on B8 binding motifs, from larger peptide IETVPVKLPGMDGPKVKQWPLTEE CTEMEKEGKISKIGP	recRT injection	murine(H2 ^k)	[De Groot (1991)]
RT(205-219)	Murine and human helper and CTL epitope CTEMEKEGKISKIGP	HIV-1 infection	human(broad)	[Hosmalin (1990)]
RT(308-320)	Murine and human helper and CTL epitope WKGSPAIFQSSMT		human(B7)	[Brander & Walker(1995)]
RT(325-349 PV22)	Unpublished, B. Wilkens AIFQSSMTKILEPFRKQNPDIVIYQ HIV-1 specific CTLs release γ -IFN, and α - and β -TNF	HIV-1 infection	human(A11)	[Jassoy (1993)]
RT(325-349)	AIFQSSMTKILEPFRKQNPDIVIYQ Study of cytokines released by HIV-1 specific activated CTL	HIV-1 infection	human(A11)	[Price (1995)]
RT(325-333)	AIFQSSMTK Unpublished, B. Wilkens		human(A3.1)	[Brander & Walker(1995)]
RT(325-333 LAI)	AIFQSSMTK Exploration of A11 binding motif; this peptide is mislabeled as a gag peptide in Zhang et al.	human(A11)	Zhang (1993) Zhang et al.	
RT(325-333 LAI)	AIFQSSMTK Review of HIV CTL epitopes; defined as minimal peptide by titration curve	human(A11)	[McMichael & Walker(1994)]	
RT(325-333 LAI)	AIFQSSMTK Defined as minimal peptide by titration curve, S. Rowland-Jones, per. comm.	human(A33)	[K. Ariyoshi, unpublished]	
RT(342-366 LAI)	NPDIVIYQYMDDLYVGSDLEIGQHR One of five epitopes defined for RT specific CTL clones	HIV-1 infection	human(A11)	[Walker (1989)]
RT(342-350 LAI)	HPDIVIYQY Review of HIV CTL epitopes; defined as minimal peptide by titration curve	human(B35)	[McMichael & Walker(1994)]	

CTL RT Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
RT(329-337)	HPDIVIYQQY NPDIVIYQQY preferred sequence for some CTL clones, HIV-2 NPDVILIQY is also recognized	HIV infection	human(B35)	[Rowland-Jones (1995)]
RT(346-354 LAI)	VIYQYMDDL Unpublished, T. Harrer; defined as minimal peptide by titration curve [McMichael & Walker(1994)]		human(A2)	[Brander & Walker(1995)]
RT(359-383 HXB2)	DLEIGQHRTKIEELRQHLLRWGLTT One of five epitopes defined for RT specific CTL clones	HIV-1 infection	human(Bw60)	[Walker (1989)]
RT(461-485 HXB2)	PLTEEAELELAENREILKEPVHGVY One of five epitopes defined for RT specific CTL clones	HIV-1 infection	human(A2)	[Walker (1989)]
RT(476-484)	ILKEPVHGV CTL clones recognize naturally processed peptide; peptide abundance corresponded to level of CTL killing	HIV-1 infection	human(A2)	[Tsomides (1994)]
RT(476-485 LAI)	ILKEPVHGVY Review of HIV CTL epitopes; defined as minimal peptide by titration curve		human(Bw62)	[McMichael & Walker(1994)]
RT(476-484 LAI)	ILKEPVHGV Precise identification of the nonamer that binds to A2	HIV-1 infection	human(A2)	[Tsomides (1991)]
RT(476-484 LAI)	ILKEPVHGV Promotes assembly of HLA-A2 molecules in T2 cell lysates		human(A2)	[Connan (1994)]
RT(510-518)	ILKEPVHGV Studied in the context of HLA A2 peptide binding		human(A2)	[Parker (1992)]
RT(495-515 LAI)	EIQKQGQGQWTYQIYQEPFKNLKTG One of five epitopes defined for RT specific CTL clones	HIV-1 infection	human(A11)	[Walker (1989)]
RT(507-519 LAI)	QIYQEPFKNLKTG This epitope was listed in a review		human(A11)	[Johnson & Walker(1994)]
RT(507-516)	QIYQEPFKNLK Study of cytokines released by HIV-1 specific activated CTL	HIV-1 infection	human(?)	[Price (1995)]

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CTL RT Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
RT(648-672 PV22)	AIYLALQDSGLEVNIVTDSQYALGI A CTL response used to study gene usage in HLA B14 response	HIV-1 infection	human(B14)	[Kalams (1994)]
RT(648-672)	AIYLALQDSGLEVNIVTDSQYALGI Study of cytokines released by HIV-1 specific activated CTL	HIV-1 infection	human(?)	[Price (1995)]
RT(648-672)	ALQDSGLEVVTDSQYALGI Unpublished, S. Kalams		human(B14)	[Brander & Walker(1995)]
RT(640-648 HXB2R)	ALQDSGLEV Epitope studied in the context of inclusion in a synthetic vaccine		human(A2)	[Brander (1995)]
RT(663-672 LAI)	VTDSQYALGI Unpublished, P. Johnson; defined as minimal peptide by titration curve		human(B14)	[Brander & Walker(1995)]
RT(956-964 HXB2R)	LLWKGEGAV Studied in the context of HLA A2 peptide binding		human(A2)	[McMichael & Walker(1994)]
RT(956-964 HXB2R)	LLWKGEGAV Epitope studied in the context of inclusion in a synthetic vaccine		human(A2)	[Parker (1992), Parker (1994)]
				[Brander (1995)]

RT CTL-EPITOPES

1	FFREDLVFPKGKAREFSSEQTRTNSPTRRELQVQGRDNNSLSEAGANRQG	50
51	AVSFNFPQITLWQRPLVTIKIEGQLKEALLDTGADDTVLEDMNLPWKWP	100
101	KMIGGIGGFIKVROYDQVPIEICGHKAIGTVLVGPTPVNIIGRNLLTQIG	150
	HLA-B8	
151	CTLNFPISF IETVPPV KLKP GM DGP K V QWPLTEEK IKALVEIC TEN EKE G	200
	HLA-B8	2 HLA-broad HLA-murine H2K
201	KISKIGPENPYNTPVFAIKKDSTKWRKLVDRELNKRTQDFWEVQLGIP	250
251	HPSGLKKKS VT LDVGDAYF SVPLDED FRKYTAFTIPSINNETPGIRYQ	300
	4 HLA-A33, HLA-A11, HLA-A3.1 5 HLA-B35 6 HLA-A2 7 HLA-A11	
301	YNVLPOGV KGSPAIFQS SMITKILEPFRKQNP DIVIYQYHDDLYVGSDLEI	350
	8 HLA-Bw60	
351	GQHRTKIEELRQHLLRWGFTTPDKKHQKDPPFLWMGYELHPDKWTVQPIK	400
401	LPEKESWTYND IQKLVG KLNWASQIYAGIKVKQLCKLLRGTKALTEIIPI T	450
	6 HLA-B62 7 HLA-A2 8 HLA-A11	
451	TEEAELAEMREILKEPVHGYYDPSKDLIAELOQOGOGQTYQIYQEP	500
501	FKNLKTGKYARVRAHTNDVKQLTEAVQKITTESIVIWGKTPFKLPIQK	550
551	ETWETWWTEYWQATWIPEWEFVNTPPLVKLWYQLEKEPIVGAETFYVDGA	600
	10 HLA-A2 11 HLA-B14 12 HLA-B14	
601	ANKETKLGAGYVTNRGRQRVVS LTD TTNQKTELQ AHLALQDSGLEVN I	650
	13 HLA-B14 14 HLA-B14	
651	VIDSQYALGI IQAQPDQSESELVSQII IEQLIKKEKVYLAWVPAHK GIGGN	700
701	EQVDKLVSSGIRKVLFLDGIDKAQEEHEKYHSNWRAMASDFNLPPVVAKE	750
751	IVASCDKCQLKG EAMHGQVDCSPGIWQLDC THLEGKII LVAHV ASGYIE	800
801	AEVIPAETGQETAYFILKLAGRWPVKTI HTDNGSNFT TTVKAACWWAGI	850
851	KQEFGIPYNPQSQGVIESMNKELKKIIGQVRDQAELKTA VQMAVF IHNF	900

RT CTL-EPITOPES continued

901	KRKGGIGGYSAGERIIDIIATDIQTQQLQKQITKIQNFRVYYRDSRDPLW	950
	HLAA ₂ 12	
951	KGP A AKLLWKGEGAVVIQDNSDIKVVP R RKAKIIRDY G KQMAGDDCVASRQ	1000
1001	DED	1003

Epitopes and protein variability:

This plot shows a score that is a measure of variability for each position in the RT protein alignment, and the relative positions of regions with defined CTL epitopes as seen on the CTL epitope map. The solid lines are positions where the most common character in a gp41 protein alignment is an amino acid; the dashed lines represent regions where the most common character is an insertion (dash) incorporated to maintain the alignments. The alignment used corresponds to the 1995 gp41 protein alignment, publically available at the Human Retroviruses and AIDS database, totaling 21 sequences. See the "how to use the CTL section" information for more details on the variability measure. The higher scores indicate more variation; 0 is perfectly conserved. The different protein alignments (gp120, gp41, p24, p15, p17, Nef and RT) used to create these plots contain different sets of sequences; therefore each plot is internally consistent, but cannot be compared to other protein plots.

Most common amino acid in each position in the RT protein is shown below. The numbering corresponds to the numbering in the variability plot for the RT protein.

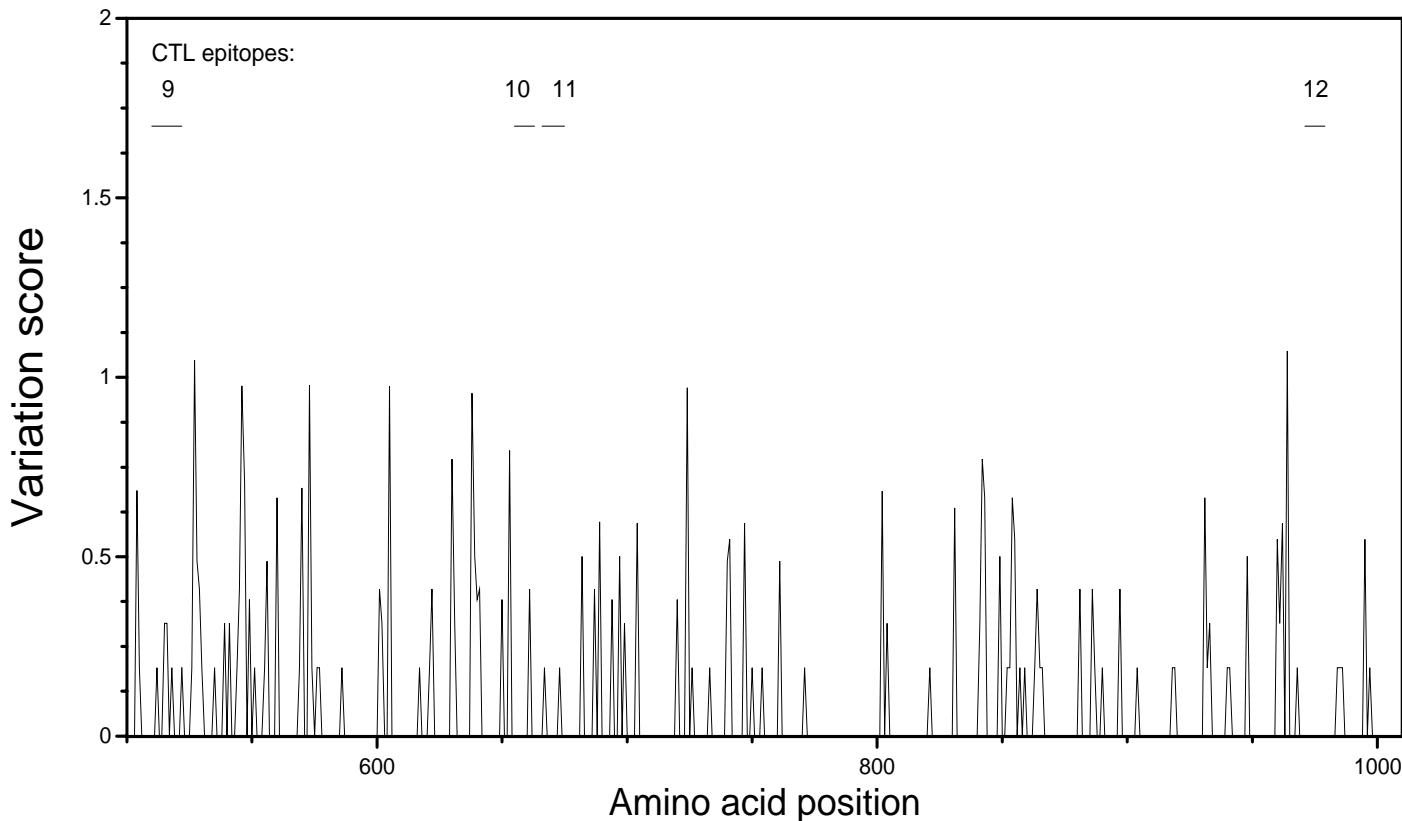
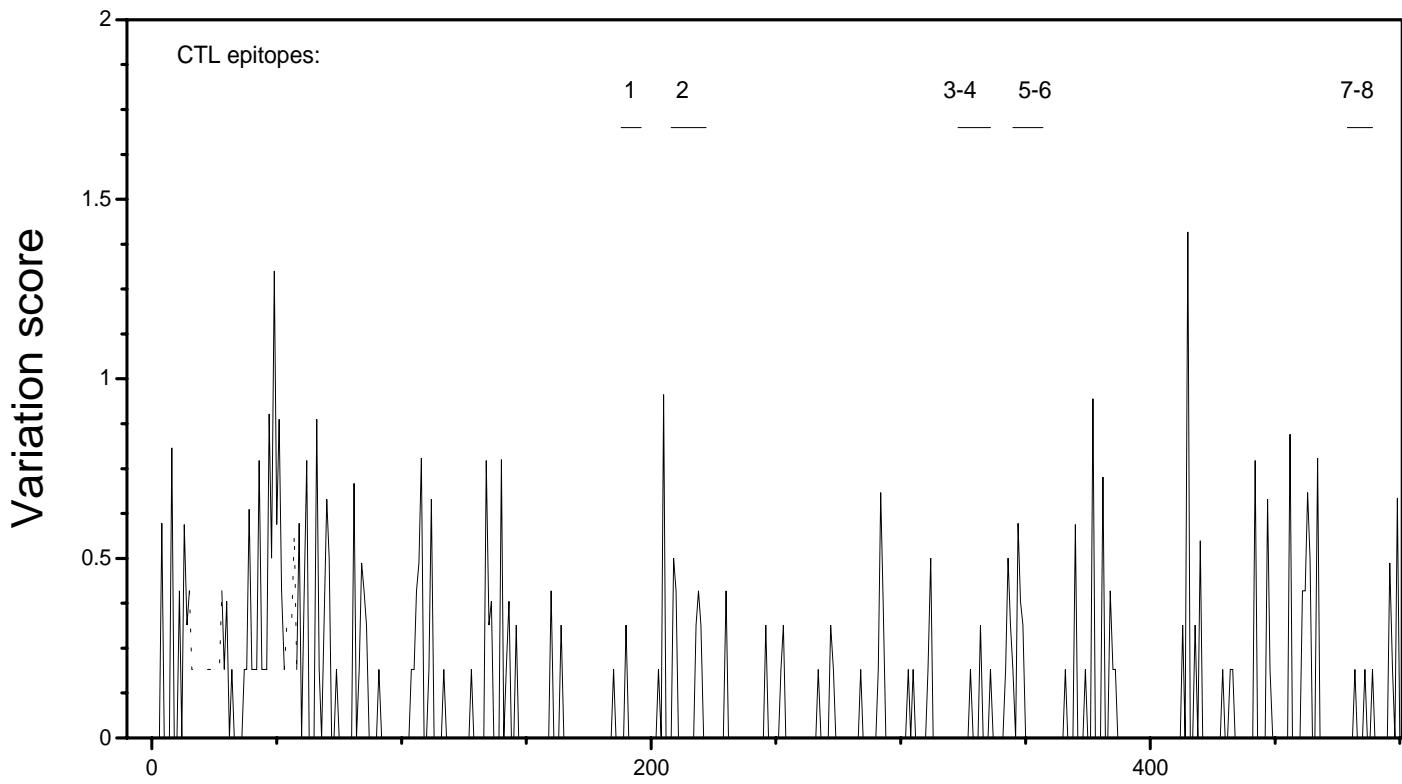
RT CONSENSUS:

```
FFREDLAFPQGKAREF-----SSEQTRANSPTRRELQVWGRDN 50
NSLS----EAGADRQGTVSFSFPQITLWQRPLVTIKIGGQLKEALLDTGA 100
DDTVLEEMNLPGRWKPKMIGGIGGFIKVRQYDQILIEICGHKAIGTVLVG 150
PTPVNIIGRNLLTQIGCTLNFPISPIETVPVKLKPGMDGPVKQWPLTEE 200
KIKALVEICTEMEKEGKISKIGPENPYNTPVFAIKKKDSTKWRKLVDRE 250
LNKRTQDFWEVQLGIPHPAGLKKKSVTLDVGDAYFSVPLDKDFRKYTA 300
FTIPSINNETPGIRYQYNVLPGWKGSPAIFQSSMTKILEPFRKQNPDIV 350
IYQYMDDLYVGSDLEIGQHRTKIEELRQHLLRGFTTPDKKHQKEPPFLW 400
MGYELHPDKWTVQPIVLPEKDSWTVNDIQKLVGKLNWASQIYAGIKVKQL 450
CKLLRGTKALTEVIPLTEEAELAENREILKEPVHGYYYDPSKDLIAEI 500
QKQGQQWTYQIYQEFPKNLKTGKYARMRGAHTNDVKQLTEAVQKIATES 550
IVIWGKTPFKLPIQKETWEAWWTEYWQATWIPEWEFVNTPPLVKLWYQL 600
EKEPIVGAETFYVDGAANRETKLGKAGYVTDRGRQKVSLTDTNQKTEL 650
QAIHLALQDSGLEVNIVTDSQYALGIIQAQPDKSESELVSQIIEQLIKKE 700
KVYLAWVPAHKGIGGNEQVDKLVSAGIRKVLFLDGIDKAQEEHEKYHSNW 750
RAMASDFNLPPVVAKEIVASCDKCQLKGEAMHGQVDCSPGIWQLDCTHLE 800
GKVILVAVHVASYIEAEVIPAETGQETAYFLLLAGRWPVKTIHTDNGS 850
NFTSTTVKAACWWAGIKQEFGIPIYNPQSQGVVESMNKELKKIIGQVRDQA 900
EHLKTAVQMAVFIHNFKRKGGIGGYSAGERIVDIIATDIQTKELQKQITK 950
IQNFRVYYRDSRDPLWKGPALKLWKGEGAVVIQDNSDIKVVPRRKAKIIR 1000
```

DY

HIV CTL Epitopes

Variation in positions in the RT protein



Pol CTL epitope 1**HLA-B8**

CONSENSUS-B GPKVKQWPL
Epitope1 -----

CONSENSUS.A -----
HIVU455 -----

CONSENSUS-B -----
HIVLAI -----
HIVHXB2R -----
HIVMN -----
HIVJRCSF -----
HIVJRFL -----
HIVOYI -----
HIVSF2 -----
HIVNY5CG -----
HIVNL43 -----
HIVCAM1 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----

CONSENSUS.D -----
HIVELI -----
HIVZ2Z6 -----
HIVNDK -----

CONSENSUS-O -----
HIVMAL --R-----
HIVANT70 -----
HIVMVP5180 -----

SIVCPZGAB -----
SIVCPZANT --R-----

Pol CTL epitope 2**HLA-broad, murine H2K**

CONSENSUS-B CTEMEKEGKISKIGP
Epitope2 -----

CONSENSUS.A -N-----
HIVU455 -N-----

CONSENSUS-B -----
HIVLAI -----
HIVHXB2R -----
HIVMN -----
HIVJRCSF -----
HIVJRFL -----
HIVOYI -----V--
HIVSF2 -----
HIVNY5CG -----
HIVNL43 -----
HIVCAM1 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----

CONSENSUS.D -----R---
HIVELI --D-----R---
HIVZ2Z6 -----RV--
HIVNDK -----R---

CONSENSUS-O -q---q----r---
HIVMAL -KD-----L---
HIVANT70 -Q---Q----R---
HIVMVP5180 -Q---Q----R---

SIVCPZGAB -Q-----
SIVCPZANT -DKL-A-N---R---

HIV CTL Epitopes

Pol CTL epitope 3

HLA-B7

CONSENSUS-B WKGSPAIFQSSMT
Epitope3 -----

CONSENSUS.A -----S-----
HIVU455 -----S-----

CONSENSUS-B -----
HIVLAI -----
HIVHXB2R -----
HIVMN -----
HIVJRCSF -----
HIVJRFL -----
HIVOYI -----
HIVSF2 -----
HIVNY5CG -----C---
HIVNL43 -----C---
HIVCAM1 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----

CONSENSUS.D -----
HIVELI -----
HIVZ2Z6 -----
HIVNDK -----

CONSENSUS-O -----
HIVMAL -----
HIVANT70 -----
HIVMVP5180 -----

SIVCPZGAB -----S-----
SIVCPZANT -----A---

Pol CTL epitope 4

HLA-A11, HLA-A3.1, HLA-A33

CONSENSUS-B AIFQSSMTK
Epitope4 -----

CONSENSUS.A S-----
HIVU455 S-----

CONSENSUS-B -----
HIVLAI -----
HIVHXB2R -----
HIVMN -----
HIVJRCSF -----
HIVJRFL -----
HIVOYI -----
HIVSF2 -----
HIVNY5CG -----C---
HIVNL43 -----C---
HIVCAM1 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----T
HIVBCSG3C -----

CONSENSUS.D -----
HIVELI -----
HIVZ2Z6 -----
HIVNDK -----

CONSENSUS-O -----
HIVMAL -----
HIVANT70 -----
HIVMVP5180 -----

SIVCPZGAB S-----
SIVCPZANT ---A---

Pol CTL epitope 5**HLA-B35****CONSENSUS-B** NPDIVIYQYEpitope5 -----
Alt form H-----**CONSENSUS.A** H-----

HIVU455 H-----

CONSENSUS-B -----HIVLAI -----
HIVHXB2R -----
HIVMN -----
HIVJRCSF ---I---
HIVJRFL ---I---
HIVOYI -----
HIVSF2 -----
HIVNY5CG -----
HIVNL43 -----
HIVCAM1 -----
HIVHAN -----
HIVD31 -----
HIVRF --E-----
HIVYU2 ---L----
HIVBCSG3C -----**CONSENSUS.D** --E-----HIVELI --EM-----
HIVZ2Z6 --E-----
HIVNDK --E-----**CONSENSUS-O** --E?e---HIVMAL --E-----
HIVANT70 --ELE-C--
HIVMVP5180 --EVE---SIVCPZGAB ---T---
SIVCPZANT Y-AVE---**Pol CTL epitope 6****HLA-A2****CONSENSUS-B** VIYQYMDDL

Epitope6 -----

CONSENSUS.A -----

HIVU455 -----

CONSENSUS-B -----HIVLAI -----
HIVHXB2R -----
HIVMN -----
HIVJRCSF I-----
HIVJRFL I-----
HIVOYI -----
HIVSF2 -----
HIVNY5CG -----
HIVNL43 -----
HIVCAM1 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----**CONSENSUS.D** -----HIVELI -----
HIVZ2Z6 -----
HIVNDK -----**CONSENSUS-O** e-----HIVMAL -----
HIVANT70 E-C-----
HIVMVP5180 E---I---SIVCPZGAB T-----
SIVCPZANT E-----

HIV CTL Epitopes

Pol CTL epitope 7

HLA-A2

CONSENSUS-B ILKEPVHGV
Epitope7 -----

CONSENSUS.A ---D----
HIVU455 ---D----

CONSENSUS-B -----
HIVLAI -----
HIVHXB2R -----
HIVMN -----
HIVJRCSF -----
HIVJRFL -----
HIVOYI -----
HIVSF2 -----E-
HIVNY5CG -----
HIVNL43 -----
HIVCAM1 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----

CONSENSUS.D -----
HIVELI -----
HIVZ2Z6 -----
HIVNDK -----

CONSENSUS-O ?-----
HIVMAL -----
HIVANT70 R--Q----
HIVMVP5180 K-----

SIVCPZGAB -VST-----

Pol CTL epitope 8

HLA-Bw62

CONSENSUS-B ILKEPVHGKV
Epitope8 -----

CONSENSUS.A ---D----
HIVU455 ---D----

CONSENSUS-B -----
HIVLAI -----
HIVHXB2R -----
HIVMN -----
HIVJRCSF -----
HIVJRFL -----
HIVOYI -----
HIVSF2 -----E--
HIVNY5CG -----
HIVNL43 -----
HIVCAM1 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----

CONSENSUS.D -----
HIVELI -----
HIVZ2Z6 -----
HIVNDK -----

CONSENSUS-O ?-----
HIVMAL -----
HIVANT70 R--Q----
HIVMVP5180 K-----

SIVCPZGAB -VST-----

Pol CTL epitope 9**HLA-A11**

CONSENSUS-B QIYQEPFKNLKTG
Epitope9 -----

CONSENSUS.A -----
HIVU455 -----

CONSENSUS-B -----
HIVLAI -----
HIVHXB2R -----
HIVMN -----
HIVJRCSF --F-----
HIVJRFL -----I---
HIVOYI -----
HIVSF2 -----
HIVNY5CG -----
HIVNL43 -----
HIVCAM1 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----A

CONSENSUS.D -----
HIVELI -----
HIVZ2Z6 -----
HIVNDK -----

CONSENSUS-O -----eh----
HIVMAL -----QY----
HIVANT70 -----EH----
HIVMVP5180 -V--DEH----

SIVCPZGAB --F---H-----
SIVCPZANT ----NEG-L--A-

Pol CTL epitope 10**HLA-A2**

CONSENSUS-B ALQDSDLLEV
Epitope10 -----

CONSENSUS.A -----S--
HIVU455 -----S--

CONSENSUS-B -----
HIVLAI -----
HIVHXB2R -----
HIVMN -----
HIVJRCSF -----
HIVJRFL -----
HIVOYI -----
HIVSF2 -----
HIVNY5CG -----
HIVNL43 -----
HIVCAM1 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----

CONSENSUS.D -----
HIVELI -----
HIVZ2Z6 -----
HIVNDK -----

CONSENSUS-O -----ke?-
HIVMAL -----S--
HIVANT70 -----KET-
HIVMVP5180 -----KEQ-

SIVCPZGAB -----DQQ-
SIVCPZANT ---E--TGP-

HIV CTL Epitopes

Pol CTL epitope 11

HLA-B14

CONSENSUS-B VTDSQYALGI

Epitope11 -----

CONSENSUS .A -----

HIVU455 -----

CONSENSUS-B -----

HIVLAI -----

HIVHXB2R -----

HIVMN -----

HIVJRCSF -----

HIVJRFL -----

HIVOYI -----

HIVSF2 -----

HIVNY5CG -----

HIVNL43 -----

HIVCAM1 -----

HIVHAN -----

HIVD31 -S-----I--

HIVRF -----

HIVYU2 -----

HIVBCSG3C -----

CONSENSUS .D -----

HIVELI -----

HIVZ2Z6 -----

HIVNDK -----

CONSENSUS-O -----

HIVMAL -----

HIVANT70 -----V

HIVMVP5180 -----V--

SIVCPZGAB -----V--

SIVCPZANT -----V

Pol CTL epitope 12

HLA-A2

CONSENSUS-B LLWKGEHAV

Epitope12 -----

CONSENSUS .A -----

HIVU455 -----

CONSENSUS-B -----

HIVLAI -----

HIVHXB2R -----

HIVMN -----

HIVJRCSF -----

HIVJRFL -----

HIVOYI -----

HIVSF2 -----

HIVNY5CG -----

HIVNL43 -----

HIVCAM1 -----

HIVHAN -----

HIVD31 -----

HIVRF -----

HIVYU2 -----

HIVBCSG3C -----

CONSENSUS .D -----

HIVELI -----

HIVZ2Z6 -----

HIVNDK -----

CONSENSUS-O -----

HIVMAL -----

HIVANT70 -----

HIVMVP5180 -----

SIVCPZGAB -----

SIVCPZANT -----

gp120 CTL Epitopes

CTL gp120 Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
gp120(32-56)	TEKLWVTVYYGVPVWKEATTTLFCA This epitope was listed in a review		human(B7)	[Johnson & Walker(1994)]
gp120(32-56 LAI)	TEKLWVTVYYGVPVWKEATTTLFCA HLA restricted CTL response to epitope in HIV-1 vaccinia-env vaccinees	gp160 vacc vaccine	human(B18)	[Johnson (1994a)]
gp120(32-56 LAI)	TEKLWVTVYYGVPVWKEATTTLFCA This peptide can be processed for HLA-B18 presentation in a TAP-1/2 independent pathway	gp160 vacc vaccine	human(B18)	[Hammond (1995)]
gp120(32-41 LAI)	KLWVTVYYGV CTL from HLA-A2 positive subject react with this peptide; binds to HLA A*0201	MN rec gp160	human(A2?)	[Dupuis (1995)]
gp120(25-46 BRU)	LWVTVYYGVPVWKEATTTLFCA Defined through peptide blocking of CTL activity, and env deletions	HIV-1 infection	human(A2)	[Dadaglio (1991)]
gp120(37-46 LAI)	TVYYGVPVWK Multiple CTL clones obtained from two vaccinees	gp160 vaccinia	human(A3.1)	[Johnson (1994b)]
gp120(38-41 LAI)	TVYYGVPVWK Highly conserved epitope recognized by multiple CTL clones from vaccinee	gp160 vacc vaccine	human(A3.1)	[Johnson (1994a)]
gp120(37-46 LAI)	TVYYGVPVWK This peptide can be processed for HLA-A3.1 presentation in a TAP-1/2 independent pathway		human(A3.1)	[Hammond (1995)]
gp120(42-51 PV22)	VPVWKEATTT P. Johnson, unpublished		human(B55)	[Brander & Walker(1995)]
gp120(42-52 PV22)	VPVWKEATTTL B. Wilkens, unpublished		human(B35)	[Brander & Walker(1995)]
gp120(59-68 HXB2)	LFCASDAKAY CTL epitope defined by T cell line, not clones, and peptide mapping	HIV-1 infection	human(?)	[Lieberman (1992)]
gp120(53-62 LAI)	LFCASCAKAY Unpublished, P. Johnson		human(A24)	[Brander & Walker(1995)]

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CTL gp120 Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
gp120(111-126 IIIB)	MQEDIISLWDQSLKPC Primary CTL response with cells from non-infected donors stimulated by the peptide		human(?)	[Macatonia (1991)]
gp120(112-124 IIIB)	HEDIISLWDQSLK Helper and cytotoxic T cells can be stimulated by this peptide (T2)	HIV-1 infection	human(A2)	[Clerici (1991)]
gp120(120-128 LAI)	KTLPLCVTL CTL from HLA-A2 positive subject react with this peptide; peptide binds to HLA A*0201	MN rec gp160	human(A2?)	[Dupuis (1995)]
gp120(193-212 BRU)	TTSYTLTSCNTSVITQACPK Defined through blocking CTL activity, and env deletions	HIV-1 infection	human(A2)	[Dadaglio (1991)]
gp120(192-199 HXB2R)	KLTSCNTSV Epitope studied in the context of inclusion in a synthetic vaccine		human(A2)	[Brander (1995)]
gp120(197-205)	TLTSCNTSV Crystallization of HLA-A2 molecules complexed with antigenic peptides		human(A2)	[Garboczi (1992)]
gp120(201-225 LAI)	ITQACPKVSFEPIPHYCAPAGFAI CD4+ CTL isolated from LAI IIIB gp160 vaccinees	gp160 vacc vaccine	human(CD4+ CTL)	[Johnson (1994b), Johnson (1994a)]
gp120(219-238 HXB2)	PIPIHYCAPAGFAILKCNNK CTL epitope defined by T cell line, not clones, and peptide mapping	HIV-1 infection	human(?)	[Lieberman (1992)]
gp120(295-312 BRU)	SVEINCTRPNNNTRKSI Defined through blocking CTL activity, and env deletions	HIV-1 infection	human(A2)	[Dadaglio (1991)]
gp120(302-312 HXB2)	RPNNNTRKSI CTL from two acute seroconversion cases	HIV-1 infection	human(B7)	[Safrit (1994b)]
gp120(302-312 HXB2)	RPNNNTRKSI Peptide processed by a TAP-1/2-dependent pathway only		human(B7)	[Hammond (1995)]

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CTL gp120 Epitopes

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Location	Epitope Comments	Antigen	Species(HLA)	Reference
gp120(V3 loop HXB2)	RIQRGPGRFVTIGK Gag-V3 fusion protein immunization elicited V3 CTL response in mice	gag-V3 fusion vaccinia IIIB gp160	murine(H-2 ^d) murine(D ^d)	[Griffiths (1993)] [Takahashi (1988)]
gp120(315-329)	RIQRGPGRFVTIGK V3 loop CTL response in mice vaccinated with gp160	IIIB peptide R(8) F(10) MHC/peptide interaction; V(11) T cell receptor binding	murine(D ^d)	[Takahashi (1989a)]
gp120(315-329 IIIB)	RIQRGPGRFVTIGK HIV-1 infection	HIV-1 infection	human(A2)	[Dadaglio (1991)]
gp120(315-329 BRU)	Defined through blocking CTL activity, and env deletions			
gp120(315-329 IIIB)	RIQRGPGRFVTIGK Helper and cytotoxic T cells can be stimulated by this peptide (P18)	HIV-1 infection	human(A2)	[Clerici (1991)]
gp120(315-329 IIIB)	RIQRGPGRFVTIGK In a murine system multiple class I molecules can present to CTL	vaccinia IIIB gp160	murine(H-2 ^{d,p,u,q})	[Shirai (1992)]
gp120(315-329 IIIB)	RIQRGPGRFVTIGK V3:Ty-Virus-like particles	murine(H-2 ^d)	[Layton (1993)]	
gp120(315-329 IIIB)	V3-Ty-Virus-like particles can induce type specific CTL in mice in the absence of adjuvant	vaccinia IIIB gp160	human(A11)	[Achour (1994)]
gp120(315-329 IIIB)	One of 3 HLA type restrictions associated this peptide			
gp120(315-329 IIIB)	RIQRGPGRFVTIGK Two of 3 HLA type restrictions associated this peptide	gp160 vaccinia	human(A2,A3)	[Achour (1993)]
gp120(313-327 IIIB)	RIHIGPGRFYTTKN Y(11 MN) exchange with V(11 IIIB) interchanges specificities	MN gp160 vaccinia	murine(D ^d)	[Takahashi (1989b)]
gp120(313-327 IIIB, MN, RF)	SITKGPGRVIYATGQ Comparison of MN, IIIB, and RF specificities, position 11 is critical	RF gp160 vaccinia	murine(D ^d)	[Takahashi (1992)]
gp120(314-322)	GRAFVTIGK Study of peptide binding to HLA B27; epitope examined in this context		human(B27)	[Jardetzky (1991)]

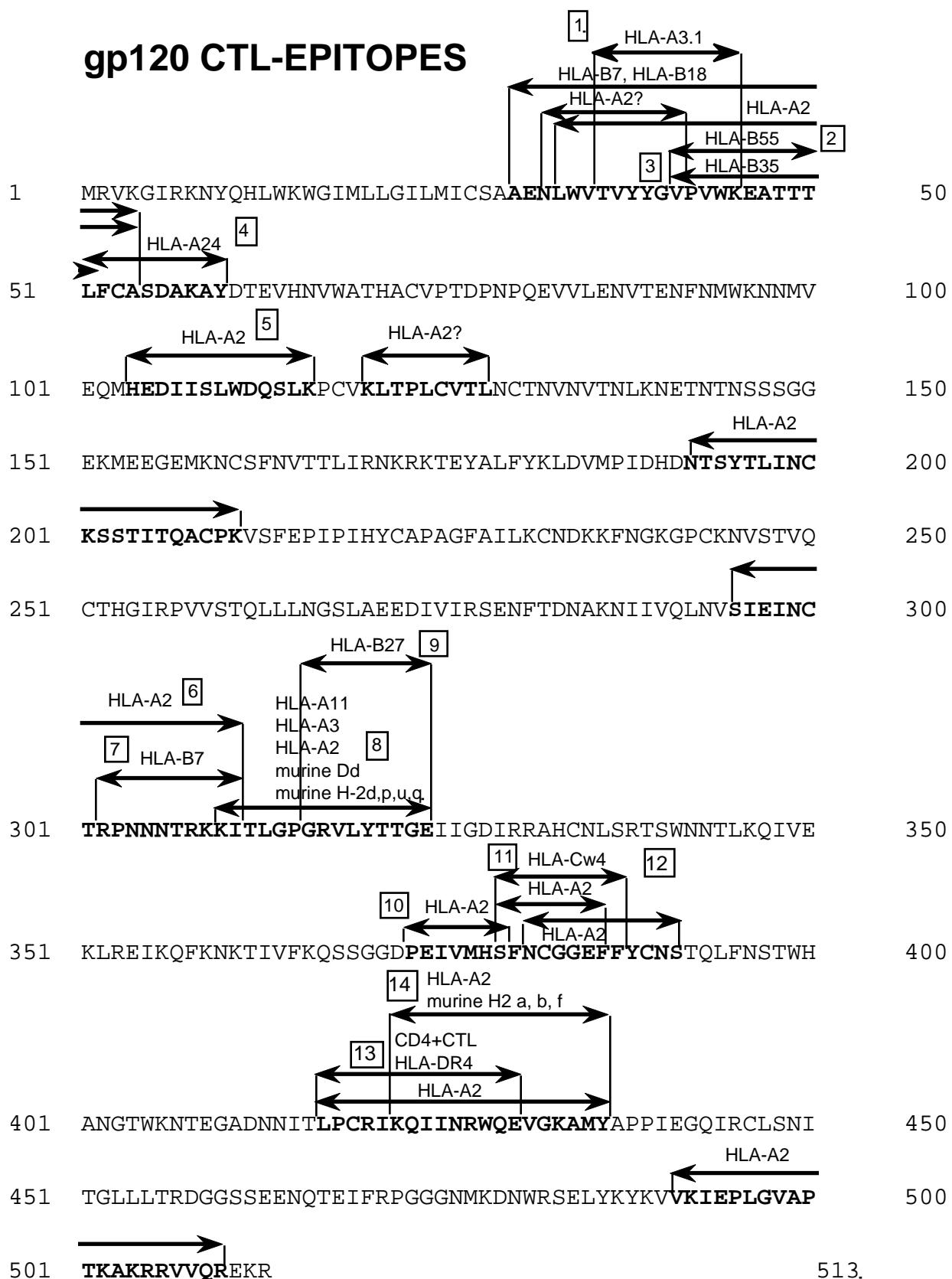
CTL gp120 Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
gp120(337-368 LAI)	KWNNTLKQIDS KLREQFGNNKTIIF CD4+ CTL clones were obtained from an HIV-1 vaccinia-env vaccinee	gp160 vaccinia	human(CD4+ CTL)	[Johnson (1994a)]
gp120(339-361 LAI)	NNTLKQIDS KLREQFG CD4+ CTL isolated from LAI IIIB gp160 vaccinees	gp160 vaccinia	human(CD4+ CTL)	[Johnson (1994b)]
gp120(374-380 BRU)	PEIVTHS Defined through blocking CTL activity, and env deletions	HIV-1 infection	human(A2)	[Dadaglio (1991)]
gp120(376-383 PV22)	SFNC GGEFF Conserved epitope; the G to R substitution FNC RGEFF abolished CTL recognition	HIV-1 infection	human(Cw4)	[Johnson (1993)]
gp120(377-387)	NSG GEF Y SNS Peptides recognized by class I restricted CTL can bind to class II		human(A2)	[Hickling (1990)]
gp120(381-392 BRU)	KNC GGEFF Y CNS Defined through blocking CTL activity, and env deletions	HIV-1 infection	human(A2)	[Dadaglio (1991)]
gp120(421-440 LAI)	LPCRI KQFIN MWQEV GKAMY Defined through blocking CTL activity, and env deletions	HIV-1 infection	human(A2)	[Dadaglio (1991)]
gp120(410-429 H3DCG)	LPCRI KQFIN MWQE CD4+ CTL restricted by class II HLA-DR4, targets primed by CD4 mediated uptake of gp120	HIV-1 infection	human(DR4 CD4+)	[Siliciano (1988)]
gp120(428-443 IIIB)	KQIIN MWQEV GKAMYA In a murine system multiple class I molecules can present to CTL	vaccinia IIIB gp160	murine(H-2 ^{a,b,f})	[Shirai (1992)]
gp120(421-440 LAI)	KQF IN MWQEV GKAMY Defined through blocking CTL activity, and env deletions	HIV-1 infection	human(A2)	[Dadaglio (1991)]
gp120(428-443 IIIB)	KQIIN MWQEV GKAMYA Helper and cytotoxic T cells can be stimulated by this peptide (T1)	HIV-1 infection	human(A2)	[Clerici (1991)]
gp120(428-443 IIIB)	KQIIN MWQEV GKAMYA Helper and cytotoxic T cells can be stimulated by this peptide (T1)	HIV-1 infection	human(A2)	[Cease (1987)]
gp120(494-513 BRU)	VKIEPLGVAPTKAKRRVVQR Defined through blocking CTL activity, and env deletions	HIV-1 infection	human(A2)	[Dadaglio (1991)]

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HIV CTL Epitopes

gp120 CTL-EPITOPES



Epitopes and protein variability:

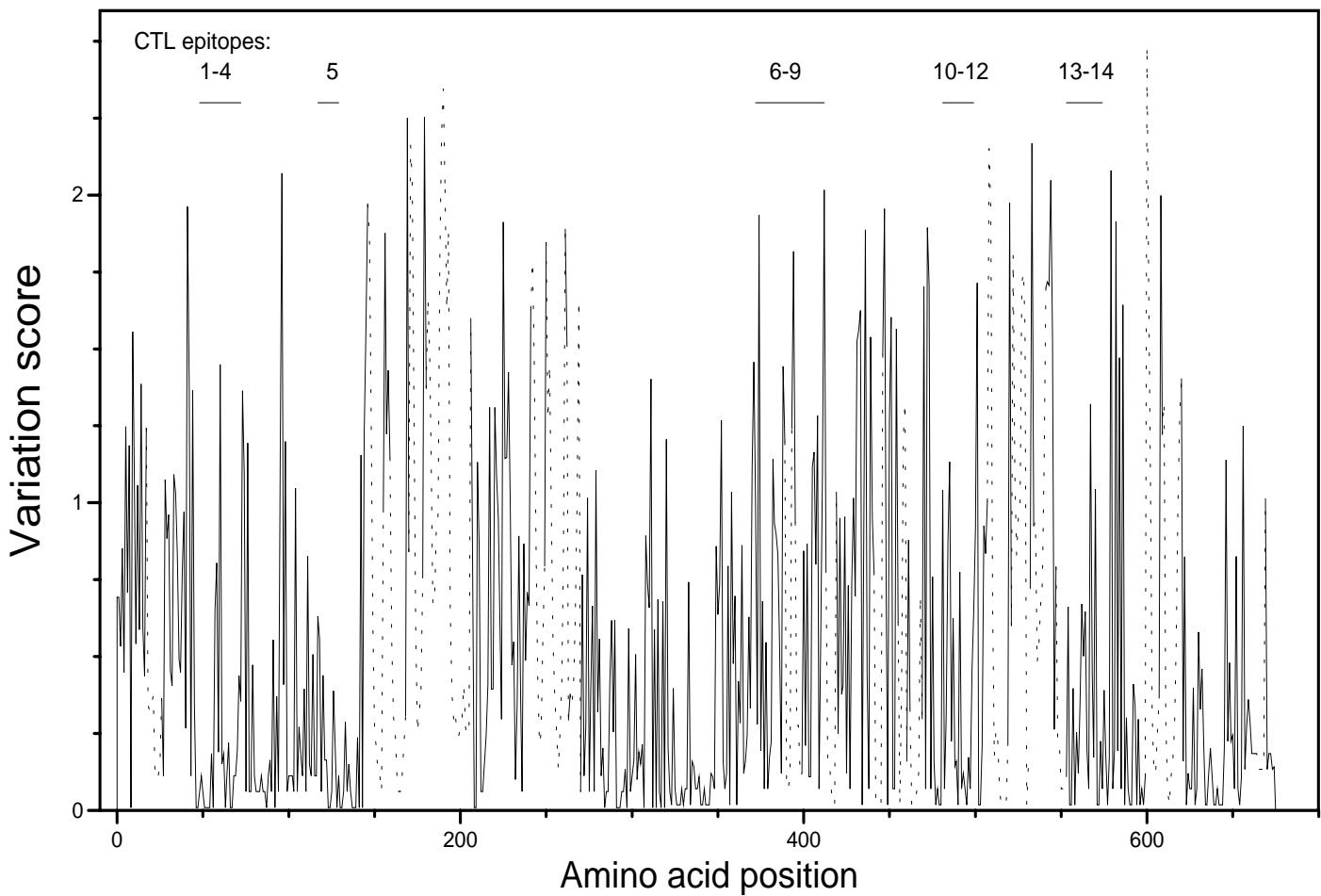
This plot shows a score that is a measure of variability for each position in the gp120 protein alignment, and the relative positions of regions with defined CTL epitopes as seen on the CTL epitope map. The solid lines are positions where the most common character in a gp120 protein alignment is an amino acid; the dashed lines represent regions where the most common character is an insertion (dash) incorporated to maintain the alignments. The alignment used corresponds to the 1995 gp120 protein alignment, publically available at the Human Retroviruses and AIDS database, totaling 110 sequences. See the "how to use the CTL section" information for more details on the variability measure. The higher scores indicate more variation; 0 is perfectly conserved. The different protein alignments (gp120, gp41, p24, p15, p17, Nef and RT) used to create these plots contain different sets of sequences; therefore each plot is internally consistent, but cannot be compared to other protein plots.

Most common amino acid in each position in the gp120 protein is shown below. The numbering corresponds to the numbering in the variability plot for the gp120 protein.

gp120 CONSENSUS:

MRVKGI-RKNYQHLWR-----WGTMLLGMLMICSAAE-NLWVTVYY	50
GVPVWKEATTLFCASDAKAYDTEVHNWATHACVPTDPNPQEIVLE-NV	100
TENFNMWKNNMVEQMHEIDIISLWDQSLKPCVKLTPLCVTLNCTDL----	150
-----NAT-----NST-----M-----	200
----GE--IKNCASFNITTEIRDKKQKEYALFYKLDVVPID-----N--	250
-----N-S-----YRLINCNTSVITQACPKVSFEPIPIHYCAPAG	300
FAILKCNDKKFNGTG-PCKNVSTVQCTHG-IKPVVSTQLLNGLAEEEV	350
VIRSENFTNNAKTIIIVQLNESVEINCTRPNNNTR-KS---IRI---GPG	400
R--AFYA-TGDI----IGDIRQAHCNISRANKNNTLQQV---AKKLRE	450
--QF----NKT-----IIFNP-SS-GGDPEITTHSFNCGGEFFYCNTSQ	500
LFNSTW-----NST-----NST-----NDTIT---	550
-LP-CRIKQIINMWQEVGK-AMYAPPIS-GQIRCSSNITGLLTRDGG--	600
----NST-----NET-FRPGGGDMRDNRSELKYKVVKIEPLG	650
VAPTR-AKRRVV----QREKRA	

Variation in positions in the gp120 protein



gp120 CTL epitope 1**HLA-A3.1**

CONSENSUS-B	TVYYGVPVWK
Epitiopel	-----

CONSENSUS-A	-----
--------------------	-------

HIVSF1703	-----
HIVU455	-----
HIVZ321	-----
92RW020.5	A-----
HIVUG0314	-----
HIVNI	-----
HIVRW0914	-----
HIVUG275A	-----R
HIVUG273A	-----R
HIVVI191A	--F----
HIVDJ264A	-----R
HIVDJ263A	-----R
HIVDJ258A	-----R
HIVCARGAN	-----
HIVCARSAAS	-----
HIVCAR4054	-----R
HIVCAR286A	-----
HIVCAR4023	-----R
HIVCAR423A	-----R
HIVKENYA	-----
92UG031.7	-----
92UG037.8	-----
A_92UG037.8	-----
A_92RW009.2	-----
A_HIVTZ016	-----
A_HIVTZ017	-----

CONSENSUS-B	-----
--------------------	-------

HIVJRCNF	-----
HIVJRFL	-----
HIVALA1	-----
HIVBRVA	-----
HIVJH32	-----
HIVBAL1	-----
HIVYU2	-----
HIVMN	-----
HIVHXB2R	-----
HIVLAI	-----
HIVNL43	-----
HIVMFA	-----
HIVCAM1	-----
HIVNY5CG	-----
HIVADA	-----
HIVJFL	-----
HIVSIMI84	-----

CONSENSUS-B

HIVD31	-----
HIVSF162	-----
HIVBCSG3C	-----
HIVOYI	-----
HIVSF33	-----
HIVCDC42	-----
HIVSF2	-----
HIVSF2B13	-----
HIVHAN	-----
HIVRF	-----
HIVWMJ22	-----
HIVTB132	-----
92BR020.4	-----
HIVTH1412	-----
92US711.14	-----
91US712.4	-----
92US715.6	-----
92US716.6	-----
92HT593.1	-----
92HT594.10	-----
92HT596.4	-----
92HT599.24	-----
91HT651.11	-----
HIVRJS	-----
HIVGUN	-----
HIVSC	-----
HIVBR0141	-----
HIVTH0266	-----
HIVBR0216	-----
HIVMA1CON	-----
HIVP896	-I-----R
91US006.10	-----
91US005.11	-----
92US657.1	-----
92US714.1	-----
B_92BR028.8	---F-----
B_HIV8020	-----
B_HIV1CM237X	-----
B_91HT652.11	-----
B_HIVMANC	-----
B_HIV3202A12	-----
B_HIVWEAU160	-----
B_HIVVE1	-----
B_HIVVE2	-----
B_HIVVE3	-----
B_HIVVE4	-----
B_HIVVE5	-----
B_HIVVE6	-----
B_HIVVE7	-----
B_HIVVE8	-----
B_HIVDI2ACD	-----
B_HIVGP120	-----
B_HIV168A	-----

HIV CTL Epitopes

CONSENSUS-B	TVYYGVPVWK	CONSENSUS-B	TVYYGVPVWK
B_HIVENVVA	-----	CONSENSUS-E	-----R
B_HIVETR	-----	93TH966.8	-----R
B_HIVUS1	-----	93TH975.15	-----R
B_HIVUS2	-----	92TH022.2	-----
B_HIVUS3	-----	HIVTN243	-----R
B_HIVUS4	-----	HIVTH0065	-G-----R
B_HIV117305	-----	HIVTH0115	-----R
B_HIV124612	-----	HIVCARELO	-----A-R
B_HIV126807	-----	HIVCAR4017	-----A--
B_HIV127290	-----	HIVCAR4071	-----R
B_HIV127481	-----	HIVCARMBA	-----
B_HIV14995	-----	E_92TH022.4	-----
		E_93TH976.17	-----
CONSENSUS-C	-----	E_HIVTN235	-----R
93MW959.18	-----	E_HIVTN239	-----R
93MW960.3	-----	E_HIVTN242	-----R
HIVZAM20A	-----	CONSENSUS-F	-----
HIVD1024	-----	HIVBRA7944	-----
HIVBR0255	-----	HIVBZ163A	-----
HIVSM145A	-----R	HIVBZ126A	-----
HIVZAM18A	-----	93BR019.17	-----
HIVDJ259A	-----	93BR029.2	-----
HIVDJ373A	-----Q	CONSENSUS-G	-----E
HIVSE364A	-----	HIVLBV217	-----A-E
HIVUG268A	-----	HIVCAR4067	-----E
92BR025.9	-----	92RU131.9	-----E
C_93MW965.26	-I-----	92UG975.10	-----A-E
CONSENSUS-D	-----	G_HIV47621	-----E
HIVJY1	-----	G_HIV47622	-----E
HIVNDK	-----I--	HIVANT70	---A----E
HIVELI	-----	HIVMVP5180	---S----E
HIVZ2Z6	-----	HIVVAU	---S----E
HIVUG0219	-----	SIVCPZGAB	-----H
HIVUG0468	-----	SIVCPZANT	--F-----R
HIVUG0381	-----	HIVCAR4081	-----
HIVUG269A	-----	HIVZ3	-----
HIVUG274A	-----	GX_HIVVI525A	-----E
HIVSE365A	-----	AC_HIVZAM184	-----R
HIVCAR4020	-----	AD_HIVK124A	-----R
92UG024.2	-----	AD_HIVUG266A	-----
93ZR001.3	-----	AD_HIVMAL	-----
D_HIV43424	-----	AE_HIVCAR4039	-----R
D_HIVTZ005	-----	BF_93BR020.10	-----
D_HIVTZ012	-----		
D_HIVTZ023	-----		
D_HIVTZ030	-----		
D_HIVTZ053	-----		
D_HIVTZ064	-----		
D_HIVTZ112	-----		

gp120 CTL epitope 2**HLA-B55**

CONSENSUS-B	VPVWKEATTT
Epitope2	-----

CONSENSUS-A	-----D-E--
HIVSF1703	-----D-E--
HIVU455	-----D-V--
HIVZ321	-----D-E--
92RW020.5	-----D-E--
HIVUG0314	-----E--
HIVNI	-----T-E--
HIVRW0914	-----D-E--
HIVUG275A	-----RD-E--
HIVUG273A	-----RD-E--
HIVVI191A	-----D-E--
HIVDJ264A	-----RD-E--
HIVDJ263A	-----RNTE--
HIVDJ258A	-----RD-K--
HIVCARGAN	-----N-D--
HIVCARSAAS	-----D-K--
HIVCAR4054	-----R--N--
HIVCAR286A	-----DRE--
HIVCAR4023	-----RD-N--
HIVCAR423A	-----RD-N--
HIVKENYA	-----N-E--
92UG031.7	-----E--
92UG037.8	-----D-E--
A_92UG037.8	-----D-E--
A_92RW009.2	-----D-E--
A_HIVTZ016	-----
A_HIVTZ017	-----D-E--

CONSENSUS-B	-----
HIVJRCFSF	-----T---
HIVJRFL	-----
HIVALA1	-----
HIVBRVA	-----N--
HIVJH32	-----A--
HIVBAL1	-----
HIVYU2	-----
HIVMN	-----
HIVHXB2R	-----
HIVLAI	-----
HIVNL43	-----
HIVMFA	-----
HIVCAM1	-----
HIVNY5CG	-----
HIVADA	-----
HIVJFL	-----
HIVSIMI84	-----
HIVD31	-----
HIVSF162	-----
HIVBCSG3C	-----

CONSENSUS-B	VPVWKEATTT
HIVOYI	-----
HIVSF33	-----D----
HIVCDC42	-----
HIVSF2	-----
HIVSF2B13	-----
HIVHAN	-----
HIVRF	-----
HIVWMJ22	-----
HIVTB132	-----
92BR020.4	-----
HIVTH1412	-----
92US711.14	-----I--
91US712.4	-----
92US715.6	-----N--
92US716.6	-----
92HT593.1	-----
92HT594.10	-----
92HT596.4	-----
92HT599.24	-----D-I--
91HT651.11	-----
HIVRJS	-----
HIVGUN	-----
HIVSC	-----
HIVBR0141	-----
HIVTH0266	-----
HIVBR0216	-----
HIVACH9	-----
HIVACP1	-----
HIVJM	-----
HIVWM	-----
HIVMA208	-----
HIVMA1CON	-----
HIVP896	----R----
91US006.10	-----
91US005.11	-----T--
92US657.1	-----D--
92US714.1	-----
B_92BR028.8	-----S--
B_HIV8020	-----D--
B_HIV1CM237X	-----
B_91HT652.11	-----
B_HIVMANC	-----
B_HIV3202A12	-----
B_HIVWEAU160	-----
B_HIVVE1	-----
B_HIVVE2	-----
B_HIVVE3	-----S--
B_HIVVE4	-----
B_HIVVE5	-----
B_HIVVE6	-----
B_HIVVE7	-----I--
B_HIVVE8	-----
B_HIVDI2ACD	-----
B_HIVGP120	-----
B_HIV168A	-----

HIV CTL Epitopes

CONSENSUS-B	VPVWKEATTT	CONSENSUS-B	VPVWKEATTT
B_HIVENVVA	-----T---	CONSENSUS-E	-----RD-D--
B_HIVETR	-----	93TH966.8	-----RD-D--
B_HIVUS1	-----	93TH975.15	-----RD-D--
B_HIVUS2	-----	92TH022.2	-----D-D--
B_HIVUS3	-----	HIVTN243	-----RD-D--
B_HIVUS4	-----	HIVTH0065	-----RD-D--
B_HIV117305	-----	HIVTH0115	-----RD-D--
B_HIV124612	-----T---	HIVCARELO	--A-RD-E--
B_HIV126807	-----	HIVCAR4017	--A--D-D--
B_HIV127290	-----	HIVCAR4071	-----RD-D--
B_HIV127481	-----	HIVCARMBA	-----D-D--
B_HIV14995	-----	E_92TH022.4	-----D-D--
CONSENSUS-C	-----K--	E_93TH976.17	-----D-D--
93MW959.18	----D-K--	E_HIVTN235	-----RD-D--
93MW960.3	-----K--	E_HIVTN239	-----RD-D--
HIVZAM20A	-----K--	E_HIVTN241	-----D--
HIVD1024	-----K--	E_HIVTN242	-----RD-D--
HIVBR0255	-----K--	E_HIVTN244	-----D--
HIVSM145A	---R--K--	CONSENSUS-F	-----
HIVZAM18A	-----K--	HIVBRA7944	-----
HIVDJ259A	----D-NPP	HIVBZ163A	-----D----
HIVDJ373A	---Q--NP-	HIVBZ126A	-----
HIVSE364A	-----K--	93BR019.17	-----
HIVUG268A	-----	93BR029.2	-----
92BR025.9	-----K--	CONSENSUS-G	----ED-D--
C_93MW965.26	-----K--	HIVLBV217	--A-ED-D--
CONSENSUS-D	-----	HIVCAR4067	----EDRDAP
HIVJY1	-----	92RU131.9	----ED-D--
HIVNDK	--I-----	92UG975.10	--A-ED-D-I
HIVELI	-----	G_HIV47621	----ED-D--
HIVZ2Z6	-----	G_HIV47622	----ED-D--
HIVUG0219	-----	HIVANT70	----ED--PV
HIVUG0468	-----	HIVMVP5180	----E--APV
HIVUG0381	-----N--	HIVVAU	----ED-KP-
HIVUG269A	-----	SIVCPZGAB	----HD-DPV
HIVUG274A	-----	SIVCPZANT	----RN--P-
HIVSE365A	-----	HIVCAR4081	----D-E--
HIVCAR4020	-----E--	HIVZ3	----D-E--
92UG024.2	-----	GX_HIVVI525A	----ED-E-P
93ZR001.3	-----	AC_HIVZAM184	----R--K--
D_HIV43424	-----	AD_HIVK124A	----RD-E--
D_HIVTZ005	-----	AD_HIVUG266A	----D-E--
D_HIVTZ012	-----	AD_HIVMAL	-----
D_HIVTZ023	-----	AE_HIVCAR4039	----RD-K-N
D_HIVTZ030	-----	BF_93BR020.10	-----
D_HIVTZ053	-----		
D_HIVTZ064	-----		
D_HIVTZ112	-----T---		
D_HIV143425	-----		

gp 120 CTL epitope 3**HLA-B35**

CONSENSUS-B	VPVWKEATTL
Epitope3	-----

CONSENSUS-A	-----D-E---
--------------------	--------------------

HIVSF1703	-----D-E---
HIVU455	-----D-V---
HIVZ321	-----D-E---
92RW020.5	-----D-E---
HIVUG0314	-----E---
HIVNI	-----T-E---
HIVRW0914	-----D-E---
HIVUG275A	-----RD-E---
HIVUG273A	-----RD-E---
HIVVI191A	-----D-E---
HIVDJ264A	-----RD-E---
HIVDJ263A	-----RNTE---
HIVDJ258A	-----RD-K---
HIVCARGAN	-----N-D---
HIVCARSAAS	-----D-K---
HIVCAR4054	-----R--N---
HIVCAR286A	-----DRE---
HIVCAR4023	-----RD-N---
HIVCAR423A	-----RD-N---
HIVKENYA	-----N-E---
92UG031.7	-----E---
92UG037.8	-----D-E---
A_92UG037.8	-----D-E---
A_92RW009.2	-----D-E---
A_HIVTZ016	-----
A_HIVTZ017	-----D-E---

CONSENSUS-B	-----
--------------------	--------------

HIVJRCFSF	-----T---
HIVJRFL	-----
HIVALA1	-----
HIVBRVA	-----N---
HIVJH32	-----A---
HIVBAL1	-----
HIVYU2	-----
HIVMN	-----
HIVHXB2R	-----
HIVLAI	-----
HIVNL43	-----
HIVMFA	-----
HIVCAM1	-----
HIVNY5CG	-----
HIVADA	-----
HIVJFL	-----
HIVSIMI84	-----
HIVD31	-----
HIVSF162	-----

CONSENSUS-B

HIVBCSG3C	-----
HIVOYI	-----
HIVSF33	-----D----
HIVCDC42	-----
HIVSF2	-----
HIVSF2B13	-----
HIVHAN	-----
HIVRF	-----
HIVWMJ22	-----
HIVTB132	-----
92BR020.4	-----
HIVTH1412	-----
92US711.14	-----I---
91US712.4	-----
92US715.6	-----N--
92US716.6	-----
92HT593.1	-----
92HT594.10	-----
92HT596.4	-----
92HT599.24	-----D-I--
91HT651.11	-----
HIVRJS	-----
HIVGUN	-----
HIVSC	-----
HIVBR0141	-----
HIVTH0266	-----
HIVBR0216	-----
HIVACH9	-----
HIVACP1	-----
HIVJM	-----
HIVWM	-----
HIVMA208	-----
HIVMA1CON	-----
HIVP896	-----R---
91US006.10	-----
91US005.11	-----T---
92US657.1	-----D--
92US714.1	-----
B_92BR028.8	-----S--
B_HIV8020	-----D----
B_HIV1CM237X	-----
B_91HT652.11	-----
B_HIVMANC	-----
B_HIV3202A12	-----
B_HIVWEAU160	-----
B_HIVVE1	-----
B_HIVVE2	-----
B_HIVVE3	-----S--
B_HIVVE4	-----
B_HIVVE5	-----
B_HIVVE6	-----
B_HIVVE7	-----I---
B_HIVVE8	-----
B_HIVDI2ACD	-----
B_HIVGP120	-----

HIV CTL Epitopes

CONSENSUS-B	VPVWKEATTL	CONSENSUS-B	VPVWKEATTL
B_HIV168A	-----	CONSENSUS-E	----RD-D---
B_HIVENVVA	-----T----	93TH966.8	----RD-D---
B_HIVETR	-----	93TH975.15	----RD-D---
B_HIVUS1	-----	92TH022.2	----D-D---
B_HIVUS2	-----	HIVTN243	----RD-D---
B_HIVUS3	-----	HIVTH0065	----RD-D---
B_HIVUS4	-----	HIVTH0115	----RD-D---
B_HIV117305	-----	HIVCARELO	--A-RD-E---
B_HIV124612	-----T----	HIVCAR4017	--A--D-D---
B_HIV126807	-----	HIVCAR4071	----RD-D---
B_HIV127290	-----	HIVCARMBA	----D-D---
B_HIV127481	-----	E_92TH022.4	----D-D---
B_HIV14995	-----	E_93TH976.17	----D-D---
CONSENSUS-C	-----K---	E_HIVTN235	----RD-D---
93MW959.18	----D-K--	E_HIVTN239	----RD-D---
93MW960.3	-----K--	E_HIVTN241	-----D---
HIVZAM20A	-----K--	E_HIVTN242	----RD-D---
HIVD1024	-----K--	E_HIVTN244	-----D---
HIVBR0255	-----K--	CONSENSUS-F	-----
HIVSM145A	---R--K--	HIVBRA7944	-----
HIVZAM18A	-----K--	HIVBZ163A	----D-----
HIVDJ259A	----D-NPP-	HIVBZ126A	-----
HIVDJ373A	---Q--NP--	93BR019.17	-----
HIVSE364A	-----K--	93BR029.2	-----
HIVUG268A	-----	CONSENSUS-G	----ED-D---
92BR025.9	-----K--	HIVLBV217	--A-ED-D---
C_93MW965.26	-----K--	HIVCAR4067	----EDRDAP-
CONSENSUS-D	-----	92RU131.9	----ED-D---
HIVJY1	-----	92UG975.10	--A-ED-D-I-
HIVNDK	--I-----	G_HIV47621	----ED-D---
HIVELI	-----	G_HIV47622	----ED-D---
HIVZ2Z6	-----	HIVANT70	----ED--PV-
HIVUG0219	-----	HIVMVP5180	----E--APV-
HIVUG0468	-----	HIVVAU	----ED-KP--
HIVUG0381	----N--	SIVCPZGAB	----HD-DPV-
HIVUG269A	-----	SIVCPZANT	----RN--P--
HIVUG274A	-----	HIVCAR4081	----D-E---
HIVSE365A	-----	HIVZ3	----D-E---
HIVCAR4020	----E--	GX_HIVVI525A	----ED-E-P-
92UG024.2	-----	AC_HIVZAM184	----R--K---
93ZR001.3	-----	AD_HIVK124A	----RD-E---
D_HIV43424	-----	AD_HIVUG266A	----D-E---
D_HIVTZ005	-----	AD_HIVMAL	-----
D_HIVTZ012	-----	AE_HIVCAR4039	----RD-K-N-
D_HIVTZ023	-----	BF_93BR020.10	-----
D_HIVTZ030	-----		
D_HIVTZ053	-----		
D_HIVTZ064	-----		
D_HIVTZ112	-----T----		
D_HIV143425	-----		

gp120 CTL epitope 4**HLA-A24**

CONSENSUS-B	LFCASDAKAY
Epitope4	-----

CONSENSUS-A	-----
HIVSF1703	-----
HIVU455	-----
HIVZ321	-----
92RW020.5	--G-----
HIVUG0314	-----
HIVNI	-----
HIVRW0914	-LG-----
HIVUG275A	-----
HIVUG273A	-----
HIVVI191A	-----
HIVDJ264A	-----
HIVDJ263A	-----
HIVDJ258A	-----
HIVCARGAN	----N-R--
HIVCARSAAS	-----
HIVCAR4054	-----H
HIVCAR286A	-----
HIVCAR4023	-----
HIVCAR423A	-----
HIVKENYA	-----
92UG031.7	-----
92UG037.8	-----
A_92UG037.8	-----
A_92RW009.2	-----
A_HIVTZ016	----S-
A_HIVTZ017	-----

CONSENSUS-B	-----
HIVJRCASF	-----
HIVJRFL	-----
HIVALA1	-----
HIVBRVA	-----
HIVJH32	-----
HIVBAL1	----R--
HIVYU2	-----
HIVMN	-----
HIVHXB2R	-----
HIVLAI	-----
HIVNL43	-----
HIVMFA	-----
HIVCAM1	-----
HIVNY5CG	-----
HIVADA	-----
HIVJFL	-----
HIVSIMI84	-----
HIVD31	-----
HIVSF162	-----

CONSENSUS-B	LFCASDAKAY
HIVBCSG3C	-----
HIVOYI	-----R--
HIVSF33	-----
HIVCDC42	-----
HIVSF2	-----R--
HIVSF2B13	-----R--
HIVHAN	-----
HIVRF	-----E----
HIVWMJ22	-----
HIVTB132	-----
92BR020.4	--G-----
HIVTH1412	-----
92US711.14	-----
91US712.4	-----
92US715.6	-----
92US716.6	-----
92HT593.1	-----
92HT594.10	-----
92HT596.4	-----
92HT599.24	-----
91HT651.11	-----
HIVRJS	-----
HIVGUN	-----
HIVSC	-----
HIVBR0141	-----S-
HIVTH0266	--G-----
HIVBR0216	-----
HIVACH9	-----
HIVACP1	-----T-
HIVJM	-----
HIVWM	-----
HIVMA208	-----
HIVMA1CON	-----
HIVP896	-----
91US006.10	-----
91US005.11	-----
92US657.1	-----
92US714.1	-----
B_92BR028.8	-----
B_HIV8020	-----
B_HIV1CM237X	-----
B_91HT652.11	-----
B_HIVMANC	-----H
B_HIV3202A12	-----
B_HIVWEAU160	-----
B_HIVVE1	-----
B_HIVVE2	-----
B_HIVVE3	-----
B_HIVVE4	-----
B_HIVVE5	-----
B_HIVVE6	-----
B_HIVVE7	-----
B_HIVVE8	-----
B_HIVDI2ACD	-----S-
B_HIVGP120	-----S-

HIV CTL Epitopes

CONSENSUS-B	LFCASDAKAY	CONSENSUS-B	LFCASDAKAY
B_HIV168A	-----	CONSENSUS-E	-----H
B_HIVENVVA	-----	93TH966.8	-----H
B_HIVETR	-----	93TH975.15	-----H
B_HIVUS1	--G-----	92TH022.2	-----H
B_HIVUS2	--G-----	HIVTN243	-----H
B_HIVUS3	--G-----	HIVTH0065	--G----H
B_HIVUS4	-----	HIVTH0115	-----H
B_HIV117305	-----	HIVCARELO	-----H
B_HIV124612	-----	HIVCAR4017	-----H
B_HIV126807	-----	HIVCAR4071	-----H
B_HIV127290	-----	HIVCARMBA	-C-----H
B_HIV127481	-----	E_92TH022.4	-----H
B_HIV14995	-----	E_93TH976.17	-----H
CONSENSUS-C	-----	E_HIVTN235	-----N---H
93MW959.18	-----	E_HIVTN239	-----N---H
93MW960.3	-----	E_HIVTN241	-----H
HIVZAM20A	-----	E_HIVTN242	-----N---H
HIVD1024	-----	E_HIVTN244	-----H
HIVBR0255	-----	CONSENSUS-F	-----S-
HIVSM145A	-----S--	HIVBRA7944	-----S-
HIVZAM18A	-----	HIVBZ163A	-----S-
HIVDJ259A	-----	HIVBZ126A	-----S-
HIVDJ373A	-----	93BR019.17	-----S-
HIVSE364A	-----	93BR029.2	-----S-
HIVUG268A	-----	CONSENSUS-G	-----
92BR025.9	-----	HIVLBV217	-----
C_93MW965.26	----E---	HIVCAR4067	-----RS-
CONSENSUS-D	-----S-	92RU131.9	-----S-
HIVJY1	-----S-	92UG975.10	-----
HIVNDK	-----	G_HIVRU131	-----P-
HIVELI	-----S-	G_HIVRU570	-----
HIVZ2Z6	-----S-	G_HIV47621	-----
HIVUG0219	-----S-	G_HIV47622	-----
HIVUG0468	-----S-	HIVANT70	-----NLT
HIVUG0381	-----S-	HIVMVP5180	-----NLT
HIVUG269A	-----S-	HIVVAU	-----NLT
HIVUG274A	-----S-	SIVCPZGAB	-----H
HIVSE365A	-----S-	SIVCPZANT	----TN-SMT
HIVCAR4020	-----S-	HIVCAR4081	-----S-
92UG024.2	-----	HIVZ3	-----
93ZR001.3	-----S-	GX_HIVVI525A	-----S-
D_HIV43424	-----S-	AC_HIVZAM184	-----
D_HIVTZ005	-----S-	AD_HIVK124A	-----
D_HIVTZ012	-----S-	AD_HIVUG266A	--G-----
D_HIVTZ023	-----S-	AD_HIVMAL	-----S-
D_HIVTZ030	-----S-	AE_HIVCAR4039	-----H
D_HIVTZ053	-----QS-	BF_93BR020.10	-----S-
D_HIVTZ064	-----S-		
D_HIVTZ112	-----S-		
D_HIV143425	-----S-		

gp 120 CTL epitope 5**HLA-A2**

CONSENSUS-B **HEDIISLWDQSLK**
Epitope5 **-----**

CONSENSUS-A **-T-----**
HIVSF1703 -T-----
HIVU455 -----
HIVZ321 ---V-----
92RW020.5 -T-----
HIVUG0314 -T-----
HIVNI -----
HIVRW0914 -T-----
HIVUG275A -----
HIVUG273A -T-----
HIVVI191A Q-----
HIVDJ264A -----
HIVDJ263A -----
HIVDJ258A -----
HIVCARGAN -T---T----Q
HIVCARSAAS -T-----
HIVCAR4054 -----E--
HIVCAR286A D-----E--
HIVCAR4023 Q-----E--
HIVCAR423A -----E--
HIVKENYA -T-----
92UG031.7 -T-----
92UG037.8 -T-----
A_92UG037.8 -T-----
A_92RW009.2 -T-----
A_HIVTZ017 -T-----

CONSENSUS-B **-----**
HIVJRCSF Q--V-N----
HIVJRFL Q-----
HIVALA1 -----
HIVBRVA -----
HIVJH32 -----
HIVBAL1 -----
HIVYU2 -----
HIVMN -----
HIVHXB2R -----
HIVLAI -----
HIVNL43 -----
HIVMFA -----
HIVCAM1 -----
HIVNY5CG -----
HIVADA -----
HIVJFL -----
HIVSIMI84 -----
HIVD31 -----
HIVSF162 -----
HIVBCSG3C Q-----

CONSENSUS-B	HEDIISLWDQSLK
HIVOYI	Q-----
HIVSF33	----V----
HIVCDC42	-----
HIVSF2	Q-----
HIVSF2B13	Q-----
HIVHAN	Q-----
HIVRF	-----
HIVWMJ22	-----
HIVTB132	-----
92BR020.4	-----
HIVTH1412	-----
92US711.14	---S---
91US712.4	-----
92US715.6	-----
92US716.6	-----
92HT593.1	Q-----
92HT594.10	-----
92HT596.4	-----
92HT599.24	N-----
91HT651.11	-----
HIVRJS	-----
HIVGUN	-----E--
HIVSC	-----
HIVBR0141	-----
HIVTH0266	Q-----
HIVBR0216	Y-----
HIVACH9	-----
HIVACP1	-----
HIVJM	-----
HIVWM	----N----
HIVMA208	-----E--
HIVMA1CON	-----E--
HIVP896	-----E--
91US006.10	-----
91US005.11	-----NEA--
92US657.1	-----
92US714.1	-----
B_92BR028.8	-----
B_HIV8020	-----
B_HIV1CM237X	-----
B_91HT652.11	-----
B_HIVMANC	Q--V-----
B_HIV3202A12	-----
B_HIVWEAU160	-----
B_HIVVE1	-----
B_HIVVE2	-----
B_HIVVE3	-----
B_HIVVE4	-----
B_HIVVE5	-----
B_HIVVE6	---V-N---E--
B_HIVVE7	-----
B_HIVVE8	-----
B_HIVDI2ACD	-----G--
B_HIVGP120	-----
B_HIV168A	-----

HIV CTL Epitopes

CONSENSUS-B	HEDIISLWDQSLK	CONSENSUS-B	HEDIISLWDQSLK
B_HIVENVVA	-----	CONSENSUS-E	Q--V-----
B_HIVETR	--N-----	93TH966.8	Q--V-----
B_HIVUS1	--V-----	93TH975.15	Q--V-----
B_HIVUS2	-----	92TH022.2	Q--V-----
B_HIVUS3	-----	HIVTN243	Q--V-----
B_HIVUS4	-----R--	HIVTH0065	Q--V-----
B_HIV117305	-----	HIVCARELO	Q--V-----
B_HIV124612	-----	HIVCAR4017	Q-----ER--
B_HIV126807	-----	HIVCAR4071	Q--V-----
B_HIV127290	-----	HIVCARMBIA	-----E--
B_HIV127481	-----	E_92TH022.4	Q--V-----
B_HIV14995	-----	E_93TH976.17	Q--V-----
CONSENSUS-C	-----	E_HIVTN235	Q--V-----
93MW959.18	-----	E_HIVTN239	Q--V-----
93MW960.3	--V-----	E_HIVTN241	Q--V-----
HIVD747	--V-----	E_HIVTN242	Q--V-----
HIVD760	--V-----	E_HIVTN244	Q--V-----
HIVZAM20A	-----	CONSENSUS-F	-T-----
HIVD1024	--V-----	HIVBRA7944	-T-----
HIVBR0255	-Q-----G---	HIVBZ163A	-T-----
HIVSM145A	-----	HIVBZ126A	-T-----
HIVZAM18A	----R----	93BR019.17	-T-----
HIVDJ259A	-Q-----	93BR029.2	-T-----
HIVDJ373A	-Q-----EG--	CONSENSUS-G	-----E--
HIVSE364A	-----	HIVLBV217	-----E--
HIVUG268A	-Q-V-----	HIVCAR4067	-----E--E
92BR025.9	-Q-----	92RU131.9	-----E--
C_93MW965.26	-----	92UG975.10	-----E--
CONSENSUS-D	-----	G_HIVRU511B	-----E--
HIVJY1	-----N--	G_HIVRU131	-----E--
HIVNDK	-----	G_HIVRU570	-----E--
HIVELI	-----	G_HIV47621	-----EG--
HIVZ2Z6	-----	G_HIV47622	-----EG--
HIVUG0219	-D-----	HIVANT70	Q-----
HIVUG0468	--V-----	HIVMVP5180	-----E--
HIVUG0381	----R----	HIVVAU	-----D-----
HIVUG269A	-----E--	SIVCPZGAB	-----
HIVUG274A	-----	HIVCAR4081	-----E--
HIVSE365A	-----	HIVZ3	-----
HIVCAR4020	-----	GX_HIVVI525A	-----E--
92UG024.2	--V-----	AC_HIVZAM184	-----
93ZR001.3	-----	AD_HIVK124A	-T-----
D_HIV43424	-----	AD_HIVUG266A	-----E--
D_HIVTZ005	-Q-----	AD_HIVMAL	-----
D_HIVTZ012	-----	AE_HIVCAR4039	Q--V-----
D_HIVTZ023	-----	BF_93BR020.10	-T-----
D_HIVTZ030	-Q-----		
D_HIVTZ053	-G--.		
D_HIVTZ064	-----N--		
D_HIVTZ112	-----		
D_HIV143425	-----		

gp120 CTL epitope 6**HLA-A2**

CONSENSUS-B	SVEINCTRPNNNTRKSI
Epitope6	-----

CONSENSUS-A	P-K-----V
HIVSF1703	T-----V
HIVU455	P-K---S--Y-TRKNIR
HIVZ321	P-N-T-M-----
92RW020.5	A-K-----GV
HIVD687	P-R-----G---N-NV
HIVNI	P-K-----GV
HIVRW0914	T-L---S-----V
HIVUG06	P-T-----YKKV-RR-
HIVUG275A	P-T-----T-V
HIVUG273A	P-K-----G---T-V
HIVVI191A	P-K-----S----G-
HIVDJ264A	P-G-----V
HIVDJ263A	P-R-----V
HIVDJ258A	P-R---S--G----V
HIVCARGAN	P-N-T-I--SRT---RW
HIVCARSAAS	-----RRM
HIVCI211	N-T-D-I--S----V
HIVCAR4054	P-R-----G----G-
HIVCAR286A	P-G-----G-----
HIVCAR4023	P-I-----R-M
HIVCAR423A	P-R-----Y---M-
HIVKENYA	P-K-----M--
HIVCI31	P-R-----V
HIVCI473	P-K-----G-Y---V
HIVCI451	P-K-----V
HIVCI145	P-R-----S----V
HIVCI3291	P-K-----G----L
HIVCI3263	P-R-----G----W
HIVCI201	P-R-----S---S---
HIVCI3271	T-K---I--G----GV
HIVCI422	P-K---I-----V
HIVCI3301	P-T-----V
92UG037.8	T-T-----V
A_92UG037.8	T-T-----V
A_92RW009.2	T-Q---S-----V
A_HIVTZ016	P-K---S-----V
A_HIVTZ017	P-Q-----S----V
A_HIVCA1	P-K-----T-V
A_HIVCI47	P-K-----G-Y---V

CONSENSUS-B	-----
HIVJRCNF	--K----S-----
HIVJRFL	-----
HIVALAI	-----IYRKGR-
HIVBRVA	-----R-

CONSENSUS-B	SVEINCTRPNNNTRKSI
HIVJH32	P-V-----SKT--RR-
HIVBAL1	-----
HIVYU2	--V-----
HIVMN	--Q-----Y-K--R-
HIVHXB2R	-----R-
HIVLAI	-----
HIVNL43	-----
HIVMFA	-----
HIVCAM1	P-----L-----
HIVNY5CG	-----G-
HIVADA	-----
HIVJFL	-IA-----
HIVSIMI84	--V-----SK--TL
HIVD31	-----Y-S-R-
HIVSF162	-----
HIVBCSG3C	A-----KK--R-
HIVOYI	-----NR-
HIVSF33	-----R-RR-
HIVCDC42	-----H---RV
HIVSF2	--A-----
HIVSF2B13	--A-----G-
HIVHAN	-----G-
HIVRF	--Q-----
HIVWMJ22	-----Y--V-R-L
92BR020.4	P-D-----
HIVTH1412	-----
92US711.14	A-----
91US712.4	--M--I-----
92US715.6	--QM-----
92US716.6	--M-----
92HT593.1	T-----S-R-
92HT594.10	--V-----S---R-
92HT596.4	--V-----R-
92HT599.24	A-L-----R-V
91HT651.11	-IQ-----
HIVRJS	-IV-----Y-TKKIRH
HIVGUN	-IV-----
HIVSC	A-----TR--
HIVSBA	A-----R--
HIVSBB	T-----S-R-
HIVSBC	--Q---I-----
HIVJB02	T-----
HIVJ61	T-----
HIVBR0141	-----IQRR-
HIVTH0266	-----
HIVBR0216	T-----
HIVACH9	-----
HIVACP1	--K---I-----G-
HIVJM	T-V-----
HIVWM	P-Q---I-----G-
HIVMA208	P-----GH-----
HIVMA1CON	P-----G-----
HIVCAN0A	--K-----H-----

HIV CTL Epitopes

CONSENSUS-B	SVEINCTRPNNNTRKSI	CONSENSUS-B	SVEINCTRPNNNTRKSI
HIVFO	--A-----R--	HIVD1044	----M-----
HIVP896	--V-----RRL	HIVD1024	----V-----
HIVBWB11A	-----I-----G-	HIVD744	----E---S----
HIVCI223	--V-----	HIVD766	----V-----L
91US006.10	--V-----	HIVD808	----V-----T
91US005.11	--V-----G-----	HIVD868	P---VR-----
92US657.1	TIK-----G-	HIVBR0255	---T-----
92US714.1	--N-T-I-----R--	HIVSM145A	----R---YA----V
B_92BR028.8	-I-----G-	HIVZAM18A	----V---S-----
B_HIV8020	--A-----S--RRV	HIVDJ259A	--A-----E--
B_HIV1CM237X	-----	HIVDJ373A	-----Q--
B_91HT652.11	-IA-T-I-----	HIVSE364A	-I--V-A-----M
B_92UG005	--T-----Y-----G-	HIVUG268A	-----A-----E--
B_HIVMANC	-----S--S---	HIV1U0GOM	-----V---S-----
B_HIV3202A12	--A-----G-	HIV1BOOYD	-IK-V-----
B_HIVWEAU160	-I-----K-	92BR025.9	--G-----
B_HIV141	A-K-F-P--STTIQDG	C_93MW965.26	----V-----V
B_HIV144	--Q-----S-----G-		
B_HIV149	-----G-----G-L	CONSENSUS-D	--T-----Y----QRT
B_HIVVE1	--V-----	HIVJY1	-----D-KITRQS
B_HIVVE2	-----QG-	HIVNDK	-IV-----YKY--QRT
B_HIVVE3	-----G-	HIVELI	--K-T-A--YQ--QRT
B_HIVVE4	-----R--	HIVZ2Z6	--A-----YR-I-QRT
B_HIVVE5	--V---I-----G-	HIVUG0219	--P-----YDKVSYRT
B_HIVVE6	-I-----R-	HIVUG0468	--P---S--YE-K-RRT
B_HIVVE7	A-----RG-	HIVUG23	T-T-----YE-V-HRT
B_HIVVE8	-----Y-A-R-	HIVUG0381	--T-S-A--FYAIERQK
B_HIVDI2ACD	--T-----YK-I-RGT	HIVUG269A	--T-T---YTK--HRA
B_HIVGP120	--A-----Q-T	HIVUG274A	--T-D-A--YE-I-QRT
B_HIV168A	--D-----I--R-	HIVSE365A	--M-----Y--K-QRT
B_HIVENVVA	--V-----G-	HIVCAR4020	--N-S-----YK-QGT
B_HIVETR	T-K---I---K---RV	HIVCI132	--T-----QGT
B_HIVRJSP3	T-K-D-I-----G-	92UG024.2	--V-----Y--I-QRT
B_HIVUS1	--Q---I-----	93ZR001.3	--S-----YSKE-LKT
B_HIVUS2	A-----S-----	D_HIV43424	--L-T-A--S----Q-T
B_HIVUS3	-----	D_HIVTZ005	--A-----YR---QRT
B_HIVUS4	-----I-----	D_HIVTZ012	--T-K-S--YY-Q-RRT
B_HIV117305	----K-I-----	D_HIVTZ023	--S-----YR---RRT
B_HIV124612	--K-D-----G-	D_HIVTZ030	--T-----YK--IQRT
B_HIV126807	-----A-----G-	D_HIVTZ053	--T---S--YIKNIR.R
B_HIV127290	T-----RG-	D_HIVTZ064	--T-----YRSSTRRT
B_HIV127481	P-----G-	D_HIVTZ112	--T-----FTR--QRT
B_HIV14995	-----G-	D_HIV143425	--P-T-V--Y----Q-T
CONSENSUS-C	----V-----	CONSENSUS-E	-----S----T--
93MW959.18	----V-----R--	93TH966.8	-----S----T-T
93MW960.3	----V-----	93TH975.15	-----S----T-V
HIVD757	--R-V-----	92TH022.2	-----S----T--
HIVD747	----VY-----GV	HIVTH0065	-----S----T--
HIVD760	---VV-----	HIVTH0115	-----S----T--
HIVNOF	--D-V-----R-	HIVCARELO	-----YK---T-A
HIVSH750	-I--V-----	HIVCAR4017	A-----SKKI-T-V
HIVZAM20A	-I--V-A--G-----	HIVCAR4071	-----FKKM-T-V

CONSENSUS-B	SVEINCTRPNNNTRKSI	CONSENSUS-B	SVEINCTRPNNNTRKSI
HIVCARMBA	P-----S----T-V	GX_HIVVI525A	T-----
E_92TH022.4	-----S----T--	AC_HIVZAM184	P-Q-S----S---R--
E_HIV11643	-----S---I-T-F	AD_HIVK124A	P-R-----I----
E_93TH976.17	---S---ST---T--	AD_HIVUG266A	--I-----Y--IKIQR
E_HIVTN235	-----S----T--	AD_HIVMAL	T-T-----G---RG-
E_HIVTN239	-----S----T--	AE_HIVCAR4039	P-Q-----S--I-T-V
E_HIVTN241	-----S----T--	BF_93BR020.10	--Q-----
E_HIVTN242	-----S----T--	BF_RJI01.5	-----
E_HIVTN244	--V-----S----T--		
CONSENSUS-F	--Q-----		
HIVBRA7944	--Q-----		
HIVBZ163A	--Q-----G-		
HIVBZ126A	--Q-----Y----		
HIVCA20	-----		
HIVCA16	-I-----SKTI-RR-		
HIVCA4	-----		
HIVVI354	T-----G-		
93BR019.17	--Q-----R-		
93BR029.2	--P-----		
F_RJI03	--Q-D-----I---		
F_HIVVI325	T---T-----G-		
CONSENSUS-G	-I---T-----		
HIVLBV217	-ID-V-----		
HIVCAR4067	---I-----		
HIVJV832	-I---I-----		
HIVG3	TIG-----		
HIVG9	-I-----		
HIVJP882	-I-----		
92RU131.9	----T-----		
92UG975.10	T---I-----		
G_HIVRU511B	---I-----		
G_HIVRU131	---T-----		
G_HIVRU570	---T-----		
G_HIV47621	PIN-T-V-----		
G_HIV47622	PIN-T-V-----		
CONSENSUS-H	P-?-----??		
HIVCA13	P-V-----R-M		
HIVVI557	P-P-----		
HIVANT70	TLNMT-E--QI.DIQEM		
HIVMVP5180	PINMT-I-EGIAEVQD-		
HIVVAU	NIT-A-E--G-Q-IQK-		
HIVVI686	-ISMT-K--G-H-VQEM		
HIVCA9	T-D-T-E--G-H-VQE-		
SIVCPZGAB	A-SL--H--G-.NTR.G		
SIVCPZANT	NLT-T-I--G-R-V.RN		
HIVCAR4081	-----V		
HIVZ3	T-K-----GSDKKIRQ		

HIV CTL Epitopes

gp120 CTL epitope 7

HLA-B7

CONSENSUS-B **RPNNNTRKSI**

Epitope7 -----

CONSENSUS-A -----V

HIVSF1703 -----V

HIVU455 --Y-TRKNIR

HIVZ321 -----

92RW020.5 -----GV

HIVD687 --G---N-NV

HIVNI -----GV

HIVRW0914 -----V

HIVUG06 --YKKV-RR-

HIVUG275A -----T-V

HIVUG273A --G----T-V

HIVVI191A --S----G-

HIVDJ264A -----V

HIVDJ263A -----V

HIVDJ258A --G-----V

HIVCARGAN --SRT---RW

HIVCARSAAS -----RRM

HIVCI211 --S----V

HIVCAR4054 --G----G-

HIVCAR286A --G-----

HIVCAR4023 -----R-M

HIVCAR423A ---Y---M-

HIVKENYA -----M--

HIVCI31 -----V

HIVCI473 --G-Y----V

HIVCI451 -----V

HIVCI145 --S----V

HIVCI3291 --G-----L

HIVCI3263 --G-----W

HIVCI201 --S----S---

HIVCI3271 --G-----GV

HIVCI422 -----V

HIVCI3301 -----V

92UG037.8 -----V

A_92UG037.8 -----V

A_92RW009.2 -----V

A_HIVTZ016 -----V

A_HIVTZ017 --S----V

A_HIVCA1 -----T-V

A_HIVCI47 --G-Y----V

CONSENSUS-B -----

HIVJRCSF --S-----

HIVJRFI -----

HIVALA1 ---IYRKGR-

HIVBRVA -----R-

HIVJH32 --SKT--RR-

HIVBAL1 -----

HIVYU2 -----

HIVMN ---Y-K--R-

CONSENSUS-B

HIVHXB2R

HIVLAI

HIVNL43

HIVMFA

HIVCAM1

HIVNY5CG

HIVADA

HIVJFL

HIVSIM184

HIVD31

HIVSF162

HIVBCSG3C

HIVOYOI

HIVSF33

HIVCDC42

HIVSF2

HIVSF2B13

HIVHAN

HIVRFR

HIVWMJ22

92BR020.4

HIVTH1412

92US711.14

91US712.4

92US715.6

92US716.6

92HT593.1

92HT594.10

92HT596.4

92HT599.24

91HT651.11

HIVRJS

HIVGUN

HIVSC

HIVSBA

HIVSBB

HIVSBC

HIVJB02

HIVJ61

HIVBR0141

HIVTH0266

HIVBR0216

HIVACH9

HIVACP1

HIVJM

HIVWM

HIVMA208

HIVMA1CON

HIVCAN0A

HIVFO

HIVP896

HIVBWB11A

HIVCI223

91US006.10

91US005.11

92US657.1

92US714.1

RPNNNTRKSI

-----R-

-L-----

-----G-

CONSENSUS-B	RPNNNTRKSI	CONSENSUS-B	RPNNNTRKSI
B_92BR028.8	-----G-	HIVUG268A	-----E--
B_HIV8020	--S--R-RRV	HIV1U0GOM	--S-----
B_HIV1CM237X	-----	HIV1BOODY	-----
B_91HT652.11	-----	92BR025.9	-----
B_92UG005	--Y----G-	C_93MW965.26	-----V
B_HIVMANC	--S---S---		
B_HIV3202A12	-----G-		
B_HIVWEAU160	-----K-	CONSENSUS-D	--Y----QRT
B_HIV141	--STTIQDGGS	HIVJY1	--D-KITRQS
B_HIV144	--S----G-	HIVNDK	--YKY--QRT
B_HIV149	--G----G-L	HIVELI	--YQ---QRT
B_HIVVE1	-----	HIVZZ26	--YR-I-QRT
B_HIVVE2	-----QG-	HIVUG0219	--YDKVSYRT
B_HIVVE3	-----G-	HIVUG0468	--YE-K-RRT
B_HIVVE4	-----R--	HIVUG23	--YE-V-HRT
B_HIVVE5	-----G-	HIVUG0381	--FYAIERQK
B_HIVVE6	-----R-	HIVUG269A	--YTK--HRA
B_HIVVE7	-----RG-	HIVUG274A	--YE-I-QRT
B_HIVVE8	-----Y-A-R-	HIVSE365A	--Y--K-QRT
B_HIVDI2ACD	--YK-I-RGT	HIVCAR4020	--YK-QGT
B_HIVGP120	-----Q-T	HIVCI132	-----QGT
B_HIV168A	-----I--R-	92UG024.2	--Y--I-QRT
B_HIVENVVA	-----G-	93ZR001.3	--YSKE-LKT
B_HIVETR	-----K---RV	D_HIV43424	--S----Q-T
B_HIVRJSP3	-----G-	D_HIVTZ005	--YR---QRT
B_HIVUS1	-----	D_HIVTZ012	--YY-Q-RRT
B_HIVUS2	--S-----	D_HIVTZ023	--YR---RRT
B_HIVUS3	-----	D_HIVTZ030	--YK--IQRT
B_HIVUS4	-----	D_HIVTZ053	--YIKNIR.R
B_HIV117305	-----	D_HIVTZ064	--YRSSTRRT
B_HIV124612	-----G-	D_HIVTZ112	--FTR--QRT
B_HIV126807	-A----G-	D_HIV143425	--Y----Q-T
B_HIV127290	-----RG-		
B_HIV127481	-----G-	CONSENSUS-E	--S----T--
B_HIV14995	-----G-	93TH966.8	--S----T-T
		93TH975.15	--S----T-V
CONSENSUS-C	-----	92TH022.2	--S----T--
93MW959.18	-----R--	HIVTH0065	--S----T--
93MW960.3	-----	HIVTH0115	--S----T--
HIVD757	-----	HIVCARELO	--YK---T-A
HIVD747	-----GV	HIVCAR4017	--SKKI-T-V
HIVD760	-----	HIVCAR4071	--FKKM-T-V
HIVNOF	-----R-	HIVCARMBA	--S----T-V
HIVSH750	-----	E_92TH022.4	--S----T--
HIVZAM20A	--G-----	E_HIV11643	--S--I-T-F
HIVD1044	-----	E_93TH976.17	--ST---T--
HIVD1024	-----	E_HIVTN235	--S----T--
HIVD744	--S-----	E_HIVTN239	--S----T--
HIVD766	-----L	E_HIVTN241	--S----T--
HIVD808	-----T	E_HIVTN242	--S----T--
HIVD868	-----	E_HIVTN244	--S----T--
HIVBR0255	-----	CONSENSUS-F	-----
HIVSM145A	-YA----V	HIVBRA7944	-----
HIVZAM18A	--S-----	HIVBZ163A	-----G-
HIVDJ259A	-----E--	HIVBZ126A	---Y-----
HIVDJ373A	-----Q--	HIVCA20	-----
HIVSE364A	-----M	HIVCA16	--SKTI-RR-

HIV CTL Epitopes

CONSENSUS-B	RPNNNTRKSI
HIVCA4	-----
HIVVI354	-----G-
93BR019.17	-----R-
93BR029.2	-----
F_RJI03	----I----
F_HIVVI325	-----G-
CONSENSUS-G	-----
HIVLBV217	-----
HIVCAR4067	-----
HIVJV832	-----
HIVG3	-----
HIVG9	-----
HIVJP882	-----
92RU131.9	-----
92UG975.10	-----
G_HIVRU511B	-----
G_HIVRU131	-----
G_HIVRU570	-----
G_HIV47621	-----
G_HIV47622	-----
CONSENSUS-H	-----?--?
HIVCA13	-----R-M
HIVVI557	-----
HIVANT70	--QI.DIQEM
HIVMVP5180	-EGIAEVQD-
HIVVAU	--G-Q-IQK-
HIVVI686	--G-H-VQEM
HIVCA9	--G-H-VQE-
SIVCPZGAB	--G-.NT.RG
SIVCPZANT	--G-R-V.RN
HIVCAR4081	-----V
HIVZ3	--GSDKKIRQ
GX_HIVVI525A	-----
AC_HIVZAM184	--S----R--
AD_HIVK124A	-----I----
AD_HIVUG266A	--Y--IKIQR
AD_HIVMAL	--G----RG-
AE_HIVCAR4039	--S--I-T-V
BF_93BR020.10	-----
BF_RJI01.5	-----

gp120 CTL epitope 8**HLA-A11, HLA-A3, HLA-A2, murine H-
2d,p,u,g**

CONSENSUS-B **SIHIGPGRAYTTGE**
Epitope8 HIQR-----V-I-K

CONSENSUS-B **SIHIGPGRAYTTGE**
CONSENSUS-A **-VR----Q---A--D**

HIVSF1703 -VR----Q---A--D
 HIVU455 RYS--S-Q---V--K
 HIVZ321 --S-----FA--D
 92RW020.5 GVR----Q---A--G
 HIVD687 NV-----Q---AR-R
 HIVNI GV-----Q---A--D
 HIVRW0914 -V-----Q---A--D
 HIVUG06 R-----S---SNL
 HIVUG275A -VR----QS--A--D
 HIVUG273A -VR----Q---A--D
 HIVVI191A G-----A--Q
 HIVDJ264A -VR----QT--A--D
 HIVDJ263A -VR----QT--A--D
 HIVDJ258A -VR----QT--A--D
 HIVCARGAN RW---S-Q---AIDG
 HIVCARSAAS RM-----IA-DA
 HIVCI211 -VN---Q---A--D
 HIVCAR4054 G-----PGQAIYAT
 HIVCAR286A IM-----S--AK-V
 HIVCAR4023 -MR----QT--A--D
 HIVCAR423A M-PT--QGQVIYAT
 HIVKENYA --R----Q---A--D
 HIVCI31 -VR----Q---A--D
 HIVCI473 RTG----QT--A--K
 HIVCI451 -VR----QT--A--D
 HIVCI145 -VP----Q---A-DD
 HIVCI3291 -LR----QT--A--D
 HIVCI3263 NW-----TDG
 HIVCI201 --R----QT--A--R
 HIVCI3271 GV-----Q---AR-D
 HIVCI422 -V-----Q---A--D
 HIVCI3301 -VR----Q---A--D
 92UG037.8 -VR----QT--A--D
 A_92UG037.8 -VR----QT--A--D
 A_92RW009.2 -V-----Q---A--D
 A_HIVTZ016 -VR----Q---A--D
 A_HIVTZ017 -VR----Q---A--D
 A_HIVCA1 -VR----Q---A--D
 A_HIVCI47 RTG----QT--A--K

CONSENSUS-B -----
 HIVJRCFSF -----
 HIVJRFL -----

CONSENSUS-B **SIHIGPGRAYTTGE**
 HIVALA1 R-----H--RQ
 HIVBRVA R-TM----VY---Q
 HIVJH32 R-----KQ
 HIVBAL1 -----
 HIVYU2 --N-----L-----
 HIVMN R-----KN
 HIVHXB2R R-QR-----V-I-K
 HIVLAI R-QR-----V-I-K
 HIVNL43 R-QR-----V-I-K
 HIVMFA R-QR-----V-I-K
 HIVCAM1 --A-----TV-A-DR
 HIVNY5CG G-A-----TL-AREK
 HIVADA -----
 HIVJFL --TL-----D
 HIVSIMI84 TL-M--K---A--D
 HIVD31 R-R--AR----K-K
 HIVSF162 --T-----A--D
 HIVBCSG3C R-TT----VY-----
 HIVOYI R-S-----H--KQ
 HIVSF33 R-TS---KVL-----
 HIVCDC42 RVTL----VW-----
 HIVSF2 --Y-----H--R
 HIVSF2B13 G-----V---R
 HIVHAN G-----V---R
 HIVRF --TK---VI-A--Q
 HIVWMJ22 -LS-----R-REI
 92BR020.4 -----A--D
 HIVTH1412 ---L-----W---Q
 92US711.14 ---L-----A---
 91US712.4 -----D
 92US715.6 -----
 92US716.6 -----Q
 92HT593.1 R-S-----RA-KI
 92HT594.10 R-S-----VW---Q
 92HT596.4 R-S-----VW---Q
 92HT599.24 -G---G--TLF--HI
 91HT651.11 --N-----W-A-NI
 HIVRJS H-----V--G
 HIVGUN --T--S----HAIEK
 HIVSC -----A--D
 HIVSBA --N-----D
 HIVSBB R-S-----VAAR-
 HIVSBC --S-----
 HIVJB02 -----A--
 HIVJ61 -----A--
 HIVBR0141 I-----HA--G
 HIVTH0266 --PL---Q-W---Q
 HIVBR0216 ---M-W----A--
 HIVACH9 --P-----D
 HIVACP1 G-G-----TV--AEK
 HIVJHM ---A-----D
 HIVWM G-----K-----
 HIVMA208 --PM-----FA--D

HIV CTL Epitopes

CONSENSUS-B	SIHIGPGRAYTTGE	CONSENSUS-B	SIHIGPGRAYTTGE
HIVMA1CON	--PM-----FA--D	HIVSH750	--R----QK--A-ND
HIVCAN0A	--M---K-----G	HIVZAM20A	--R----QT-FA--A
HIVFO	--F-----Q	HIVD1044	--R----QT--A--D
HIVP896	RLS-----ARRN	HIVD1024	--R----QT--A--D
HIVBWB11A	G-NV-----L----D	HIVD744	--R----QT--A---
HIVCI223	--M---S-I-A---	HIVD766	-LR---QT--A--D
91US006.10	--T-----Q	HIVD808	-TR---QT--A--D
91US005.11	--P-----A--D	HIVD868	--R----QT--A--D
92US657.1	G-----	HIVBR0255	--R----Q---A---
92US714.1	--M-L----A--D	HIVSM145A	-VR---QT--.ND
B_92BR028.8	G--M-C--T--A---	HIVZAM18A	--R----Q---A--G
B_HIV8020	RVTM---VW-----	HIVDJ259A	--R----QT--A--D
B_HIV1CM237X	--L---K-W----P	HIVDJ373A	--R----QT--A--D
B_91HT652.11	--P-----A--D	HIVSE364A	-MR---QT--A--D
B_92UG005	G-----Y---NI	HIVUG268A	--R----QT--A--D
B_HIVMANC	--Y-----R-HV-RA	HIV1U0GOM	--R----Q---A-ND
B_HIV3202A12	G-----AARK	HIV1BOOYD	--R----Q--HA-ND
B_HIVWEAU160	K-TL---VL-----	92BR025.9	--R----Q---A---
B_HIV141	G--V-----I-APAQ	C_93MW965.26	-VR---QT--A--A
B_HIV144	G--L-----I-P-EK		
B_HIV149	-L-LH---K--YSRG		
B_HIVVE1	--M-----A---		
B_HIVVE2	G-----I----R		
B_HIVVE3	G-G----V--A--G		
B_HIVVE4	--M-F---L--N--		
B_HIVVE5	G-Y-----EK		
B_HIVVE6	R-TM---VL----Q		
B_HIVVE7	G--L-L--R---DI		
B_HIVVE8	R-S-----R-K-R		
B_HIVDI2ACD	GT---L---Y---I		
B_HIVGP120	-TQ----Q-L---RI		
B_HIV168A	R-----Q		
B_HIVENVVA	G-----V---R		
B_HIVETR	RVTM---VY-----		
B_HIVRJSP3	G--M-W--T--A--R		
B_HIVUS1	-----I-A--G		
B_HIVUS2	-----N		
B_HIVUS3	--P-----A--D		
B_HIVUS4	-----A--D		
B_HIV117305	-----Q		
B_HIV124612	G-----S-----G		
B_HIV126807	G-R--HIGGRSFYT.		
B_HIV127290	G-----Q		
B_HIV127481	G--M-L-----Q		
B_HIV14995	G-R-----A--R		
CONSENSUS-C	--R----QT--A--D	CONSENSUS-E	--T----QV--R--D
93MW959.18	--R----QV--ANND	93TH966.8	-TT---QV--R--D
93MW960.3	--R----QT--A-N-	93TH975.15	-VR---QV--R--D
HIVD757	--R----QT--A--D	92TH022.2	--T----QV--R--D
HIVD747	GVR----QT--A--D	HIVTH0065	--T----QV--R--D
HIVD760	--R----QT--A--D	HIVTH0115	--A----QV--R--D
HIVNOF	R-RV---QTV-A-NA	HIVCARELO	-AR---QV--K--S

CONSENSUS-B	SIHIGPGRAYTTGE	CONSENSUS-B	SIHIGPGRAYTTGE
HIVCAR4017	-VR----QV--K--D	HIVCAR4081	-VR----QT--A--D
HIVCAR4071	-VR----V--K--S	HIVZ3	--R----KV--AK-G
HIVCARMBA	-VR----QV--G---		
E_92TH022.4	--T----QV--R--D	GX_HIVVI525A	--KF-T--VL-A--A
E_HIV11643	-FR----QV-HK--S	AC_HIVZAM184	--RF---Q---. -ND
E_93TH976.17	--R----QV--R--D	AD_HIVK124A	--R----Q--FA--D
E_HIVTN235	--P----Q---R--D	AD_HIVUG266A	RTP--R-Q-LF--RR
E_HIVTN239	--T----QV--R--D	AD_HIVMAL	G--F---Q-L---I
E_HIVTN241	--T----QV--R--D	AE_HIVCAR4039	-VR----QV--K--S
E_HIVTN242	--T----QV--R--D	BF_93BR020.10	-----Q-----
E_HIVTN244	--T----QV--R--D	BF_RJI01.5	--N-----A--D
 CONSENSUS-F	 --?-----A---		
HIVBRA7944	---L---Q-----		
HIVBZ163A	G-----A--D		
HIVBZ126A	--YF-----H-A-K		
HIVCA20	-----A--D		
HIVCA16	R-R--L--V--A--V		
HIVCA4	--R----QV--A--D		
HIVVI354	G-R----VI-A-SA		
93BR019.17	R-SL---V---A--		
93BR029.2	--Q-----		
F_RJI03	--PL-----A--		
F_HIVVI325	G-----KV--A--A		
 CONSENSUS-G	 --TF---Q---A--D		
HIVLBV217	-----Q-L-A--A		
HIVCAR4067	--SF---Q---A--D		
HIVJV832	--P----Q---A--D		
HIVG3	--R----Q---A---		
HIVG9	--TL---Q---A--D		
HIVJP882	--TFA--Q---A--D		
92RU131.9	--TFA--Q-L-A---		
92UG975.10	--NL---Q-I-A--A		
G_HIVRU511B	--SL---Q-----		
G_HIVRU131	--TFA--Q-L-A---		
G_HIVRU570	--SF---Q-I----N		
G_HIV47621	---F---Q---A--D		
G_HIV47622	---F---Q---A--D		
 CONSENSUS-H	 ?-?-?-Q?-?A?-?		
HIVCA13	R-G--R-QT-HAI-A		
HIVVI557	--S----Q---A--D		
 HIVANT70	EMR---MAWYSMGIG		
HIVMVP5180	D-YT--M-WRSM-LK		
HIVVAU	K-MA--MAWYSMALS		
HIVVI686	EMK---MAWYSMGL-		
HIVCA9	E-R---LAWYSMGI-		
 SIVCPZGAB	EVQ----MT--NIEN		
SIVCPZANT	NLQ----MT--NVEI		

HIV CTL Epitopes

gp120 CTL epitope 9

HLA-B27

CONSENSUS-B **GRAFYTTGE**
Epitope9 **----V-I-K**

CONSENSUS-A **-Q---A--D**

HIVSF1703 -Q---A--D
HIVU455 -Q---V--K
HIVZ321 ----FA--D
92RW020.5 -Q---A--G
HIVD687 -Q---AR-R
HIVNI -Q---A--D
HIVRW0914 -Q---A--D
HIVUG06 --S---SNL
HIVUG275A -QS--A--D
HIVUG273A -Q---A--D
HIVVI191A -----A--Q
HIVDJ264A -QT--A--D
HIVDJ263A -QT--A--D
HIVDJ258A -QT--A--D
HIVCARGAN -Q---AIDG
HIVCARSAAS -----IA-DA
HIVCI211 -Q---A--D
HIVCAR4054 -Q-I-A--D
HIVCAR286A --S--AK-V
HIVCAR4023 -QT--A--D
HIVCAR423A -Q-I-A--K
HIVKENYA -Q---A--D
HIVCI31 -Q---A--D
HIVCI473 -QT--A--K
HIVCI451 -QT--A--D
HIVCI145 -Q---A-DD
HIVCI3291 -QT--A--D
HIVCI3263 -----DG
HIVCI201 -QT--A--R
HIVCI3271 -Q---AR-D
HIVCI422 -Q---A--D
HIVCI3301 -Q---A--D
92UG037.8 -QT--A--D
A_92UG037.8 -QT--A--D
A_92RW009.2 -Q---A--D
A_HIVTZ016 -Q---A--D
A_HIVTZ017 -Q---A--D
A_HIVCA1 -Q---A--D
A_HIVCI47 -QT--A--K

CONSENSUS-B **-----**
HIVJRCSE **-----**
HIVJRFL **-----**
HIVALA1 **----H--RQ**
HIVBRVA **--VY---Q**
HIVJH32 **-----KQ**
HIVBAL1 **-----**
HIVYU2 **--L-----**
HIVMN **-----KN**

CONSENSUS-B GRAFYTTGE

HIVHXB2R **----V-I-K**
HIVLAI **----V-I-K**
HIVNL43 **----V-I-K**
HIVMFA **----V-I-K**
HIVCAM1 **--TV-A-DR**
HIVNY5CG **--TL-AREK**
HIVADA **-----**
HIVJFL **-----D**
HIVSIM184 **K----A--D**
HIVD31 **R-----K-K**
HIVSF162 **----A--D**
HIVBCSG3C **--VY----**
HIVOYOI **----H--KQ**
HIVSF33 **-KVL----**
HIVCDC42 **--VW----**
HIVSF2 **----H---R**
HIVSF2B13 **--V----R**
HIVHAN **--V----R**
HIVRFR **--VI-A--Q**
HIVWMJ22 **----R-REI**
92BR020.4 **----A--D**
HIVTH1412 **--W---Q**
92US711.14 **----A--D**
91US712.4 **-----D**
92US715.6 **-----**
92US716.6 **-----Q**
92HT593.1 **----RA-KI**
92HT594.10 **--VW---Q**
92HT596.4 **--VW---Q**
92HT599.24 **--TLF--HI**
91HT651.11 **--W-A-NI**
HIVRJS **----V--G**
HIVGUN **----HAIEK**
HIVSC **----A--D**
HIVSBA **-----D**
HIVSBB **----VAAR-**
HIVSBC **-----**
HIVJB02 **----A---**
HIVJ61 **----A---**
HIVBR0141 **----HA--G**
HIVTH0266 **-Q-W---Q**
HIVBR0216 **----A---**
HIVACH9 **-----D**
HIVACP1 **--TV--AEK**
HIVJM **-----D**
HIVWM **-K-----**
HIVMA208 **----FA--D**
HIVMA1CON **----FA--D**
HIVCAN0A **-K-----G**
HIVFO **-----Q**
HIVP896 **-----ARRN**
HIVBWB11A **--L----D**
HIVCI223 **-S-I-A---**
91US006.10 **-----Q**
91US005.11 **----A--D**
92US657.1 **-----**
92US714.1 **----A--D**

CONSENSUS-B	GRAFYTTGE	CONSENSUS-B	GRAFYTTGE
B_92BR028.8	--T--A---	HIVUG268A	-QT--A--D
B_HIV8020	--VW-----	HIV1U0GOM	-Q---A-ND
B_HIV1CM237X	-K-W----P	HIV1BOOYD	-Q--HA-ND
B_91HT652.11	-----A--D	92BR025.9	-Q---A---
B_92UG005	---Y---NI	C_93MW965.26	-QT--A--A
B_HIVMANC	--R-HV-RA		
B_HIV3202A12	-----AARK		
B_HIVWEAU160	--VL-----		
B_HIV141	---I-APAQ	CONSENSUS-D	-Q-L---?I
B_HIV144	---I-P-EK	HIVJY1	-Q-L---RI
B_HIV149	--K--YSRG	HIVNDK	RQSL--ITG
B_HIVVE1	-----A---	HIVELI	-QSL---RS
B_HIVVE2	---I----R	HIVZZ6	-Q-L---KT
B_HIVVE3	--V--A--G	HIVUG0219	---S---RI
B_HIVVE4	---L--N--	HIVUG0468	-Q-Y---KL
B_HIVVE5	-----EK	HIVUG23	-Q-LI-NRI
B_HIVVE6	--VL----Q	HIVUG0381	-QVL---KK
B_HIVVE7	--R----DI	HIVUG269A	---WW---I
B_HIVVE8	----R-K-R	HIVUG274A	-Q-L---QG
B_HIVDI2ACD	---Y----I	HIVSE365A	-QVLH--RV
B_HIVGP120	-Q-L---RI	HIVCAR4020	-Q-L---RV
B_HIV168A	-----Q	HIVCI132	-Q-L----V
B_HIVENVVA	---V----R	92UG024.2	-Q-L---RR
B_HIVETR	--VY-----	93ZR001.3	-Q-L---RV
B_HIVRJSP3	--T--A--R	D_HIV43424	-Q-L---Q
B_HIVUS1	---I-A--G	D_HIVTZ005	-Q-L---RI
B_HIVUS2	-----N	D_HIVTZ012	-Q-L---RI
B_HIVUS3	-----A--D	D_HIVTZ023	-Q-L---NI
B_HIVUS4	-----A--D	D_HIVTZ030	-Q-LF--RG
B_HIV117305	-----Q	D_HIVTZ053	-Q-Y---NI
B_HIV124612	-S-----G	D_HIVTZ064	-QSL---KN
B_HIV126807	--S-----K	D_HIVTZ112	-Q---RATR
B_HIV127290	-----Q	D_HIV143425	-Q-L--MRI
B_HIV127481	-----Q		
B_HIV14995	----A--R		
CONSENSUS-C	-QT--A--D		
93MW959.18	-QV--ANND	CONSENSUS-E	-QV--R--D
93MW960.3	-QT--A-N-	93TH966.8	-QV--R--D
HIVD757	-QT--A--D	93TH975.15	-QV--R--D
HIVD747	-QT--A--D	92TH022.2	-QV--R--D
HIVD760	-QT--A--D	HIVTN243	-QV--R--D
HIVNOF	-QTV-A-NA	HIVTH0065	-QV--R--D
HIVSH750	-QK--A-ND	HIVTH0115	-QV--R--D
HIVZAM20A	-QT-FA--A	HIVCARELO	-QV--K--S
HIVD1044	-QT--A--D	HIVCAR4017	-QV--K--D
HIVD1024	-QT--A--D	HIVCAR4071	--V--K--S
HIVD744	-QT--A---	HIVCARMBA	-QV--G---
HIVD766	-QT--A--D	E_92TH022.4	-QV--R--D
HIVD808	-QT--A--D	E_HIV11643	-QV-HK--S
HIVD868	-QT--A--D	E_93TH976.17	-QV--R--D
HIVBR0255	-Q---A---	E_HIVTN235	-Q---R--D
HIVSM145A	-QT--.ND	E_HIVTN239	-QV--R--D
HIVZAM18A	-Q---A--G	E_HIVTN241	-QV--R--D
HIVDJ259A	-QT--A--D	E_HIVTN242	-QV--R--D
HIVDJ373A	-QT--A--D	E_HIVTN244	-QV--R--D
HIVSE364A	-QT--A--D		
		CONSENSUS-F	-----A---
		HIVBRA7944	-Q-----
		HIVBZ163A	-----A--D
		HIVBZ126A	----H-A-K
		HIVCA20	-----A--D

HIV CTL Epitopes

CONSENSUS-B GRAFYTTGE

HIVCA16	--V--A--V
HIVCA4	-QV--A--D
HIVVI354	--VI-A-SA
93BR019.17	--V---A--
93BR029.2	-----
F_RJI03	-----A---
F_HIVVI325	-KV--A--A

CONSENSUS-G -Q---A--D

HIVLBV217	-Q-L-A--A
HIVCAR4067	-Q---A--D
HIVJV832	-Q---A--D
HIVG3	-Q---A---
HIVG9	-Q---A--D
HIVJP882	-Q---A--D
92RU131.9	-Q-L-A---
92UG975.10	-Q-I-A--A
G_HIVRU511B	-Q-----
G_HIVRU131	-Q-L-A---
G_HIVRU570	-Q-I----N
G_HIV47621	-Q---A--D
G_HIV47622	-Q---A--D

CONSENSUS-H -Q?-?A?-?

HIVCA13	-QT-HAI-A
HIVVI557	-Q---A--D

HIVANT70	MAWYSMGIG
HIVMVP5180	M-WRSM-LK
HIVVAU	MAWYSMALS
HIVVI686	MAWYSMGL-
HIVCA9	LAWYSMGI-

SIVCPZGAB	-MT--NIEN
SIVCPZANT	-MT--NVEI

HIVCAR4081	-QT--A--D
HIVZ3	-KV--AK-G

GX_HIVVI525A	--VL-A--A
AC_HIVZAM184	-Q---.-ND
AD_HIVK124A	-Q--FA--D
AD_HIVUG266A	-Q-LF--RR
AD_HIVMAL	-Q-L----I
AE_HIVCAR4039	-QV--K--S
BF_93BR020.10	-Q-----
BF_RJI01.5	-----A--D

gp120 CTL epitope 10**HLA-A2**

CONSENSUS-B	PEIVMHS
Epitope10	-----T--

CONSENSUS-A	L---TT--
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HIVSF1703	L--TT--
HIVU455	I--TT--
HIVZ321	V--TT--
92RW020.5	I--TT--
HIVUG0314	L--TT--
HIVD687	L--TT--
HIVNI	V--TT--
HIVRW0914	L--TT--
HIVUG06	L--TT--
HIVUG275A	I--TT--
HIVUG273A	L--TT--
HIVVI191A	L--TT--
HIVDJ264A	I--TT--
HIVDJ263A	I--TT--
HIVDJ258A	I--TT--
HIVCARGAN	L--TT--
HIVCARSAAS	V--TT--
HIVCI1211	L--TT--
HIVCAR4054	I--TT--
HIVCAR286A	L-VTT--
HIVCAR4023	L-VTT--
HIVCAR423A	I--TIY-
HIVKENYA	L--TT--
HIVCI131	V--TT--
HIVCI1473	V--TT--
HIVCI1451	V--TT--
HIVCI145	L-V-T--
HIVCI13291	L--TT--
HIVCI13263	V--TT--
HIVCI1201	L--TT--
HIVCI13271	L--TT--
HIVCI1422	L--TT--
HIVCI13301	I--TT-N
92UG031.7	L--TT--
92UG037.8	L--TT--
A_92UG037.8	L--TT--
A_92RW009.2	L--TT--
A_HIVTZ016	L--TT--
A_HIVTZ017	L--TT--
A_HIVCA1	L--TT--
A_HIVCI47	V--TT--

CONSENSUS-B	-----
HIVJRCSF	-----
HIVJRFL	-----

CONSENSUS-B

CONSENSUS-B	PEIVMHS
HIVALA1	-----T--
HIVBRVA	-----
HIVJH32	-----
HIVBAL1	-----T--
HIVYU2	-----T--
HIVMN	-----
HIVHXB2R	-----T--
HIVLAI	-----T--
HIVNL43	-----T--
HIVMFA	-----T--
HIVCAM1	-----
HIVNY5CG	-----
HIVADA	-----
HIVJFL	-----T
HIVSIMI84	-----
HIVD31	-----T--
HIVSF162	-----
HIVBCSG3C	-----
HIVOYI	-----
HIVSF33	-----
HIVCDC42	-----
HIVSF2	-----
HIVSF2B13	-----
HIVHAN	-----
HIVRF	----L--
HIVWMJ22	----T--
HIVTB132	-----
92BR020.4	----F--
HIVTH1412	-----
92US711.14	---EQ--
91US712.4	---MTLM
92US715.6	----L-
92US716.6	----L-
92HT593.1	-----
92HT594.10	----L--
92HT596.4	----L--
92HT599.24	----T--
91HT651.11	L-----
HIVRJS	----T--
HIVGUN	-----T
HIVSC	-----
HIVSBA	-----
HIVSBB	----T-T
HIVSBC	-----N
HIVJB02	-----
HIVJ61	-----
HIVBR0141	-----T
HIVTH0266	Q-----
HIVBR0216	-----
HIVACH9	-----T
HIVACP1	-----
HIVJM	----R--
HIVWM	-----

HIV CTL Epitopes

CONSENSUS-B	PEIVMHS	CONSENSUS-B	PEIVMHS
HIVMA208	-----	HIVNOF	L-VTT--
HIVMA1CON	-----	HIVSH750	L--TT--
HIVCAN0A	----T--	HIVZAM20A	L--TT--
HIVFO	-----	HIVD1044	L--TT--
HIVP896	-----	HIVD1024	L--TT--
HIVBWB11A	L-----	HIVD744	L--TT--
HIVCI223	-----T	HIVD766	L--TT--
91US006.10	---E---	HIVD808	L--TT--
91US005.11	-----T	HIVD868	L--TT--
92US657.1	-----	HIVBR0255	L--TT--
92US714.1	----R--	HIVSM145A	L--TT--
B_92BR028.8	--VI--T	HIVZAM18A	L--TT--
B_HIV8020	----LNT	HIVDJ259A	L--TT--
B_HIV1CM237X	-----	HIVDJ373A	I--TT--
B_91HT652.11	----T--	HIVSE364A	L--TT--
B_92UG005	---TT--	HIVUG268A	L--TT--
B_HIVMANC	----T--	HIV1U0GOM	L--TT--
B_HIV3202A12	----R--	HIV1BOOYD	L-VTT--
B_HIVWEAU160	-----	92BR025.9	L--TT--
B_HIV141	----T--	C_93MW965.26	L--TT--
B_HIV144	----T--		
B_HIV149	----LY-	CONSENSUS-D	---TT--
B_HIVVE1	----T--	HIVJY1	---TT--
B_HIVVE2	L--E---	HIVNDK	---TS-M
B_HIVVE3	-----	HIVELI	---TT--
B_HIVVE4	L--TT--	HIVZZ6	---TT--
B_HIVVE5	---E---	HIVUG0219	---TT--
B_HIVVE6	----T--	HIVUG0468	---TT--
B_HIVVE7	-----	HIVUG23	Q--TT--
B_HIVVE8	-----	HIVUG0381	--LTT--
B_HIVDI2ACD	L--TT--	HIVUG269A	--VTK--
B_HIVGP120	---TT--	HIVUG274A	---TT--
B_HIV168A	-----	HIVSE365A	---AT--
B_HIVENVVA	-----	HIVCAR4020	L-VTT--
B_HIVETR	-----N	HIVCI132	---IT--
B_HIVRJSP3	-----	92UG024.2	---TT--
B_HIVUS1	--V----	93ZR001.3	---TT--
B_HIVUS2	-----	D_HIV43424	---TT--
B_HIVUS3	-----	D_HIVTZ005	---TT--
B_HIVUS4	----F--	D_HIVTZ012	---TT--
B_HIV117305	---A-P-	D_HIVTZ023	---TT--
B_HIV124612	-----	D_HIVTZ030	---TT--
B_HIV126807	-VG---I	D_HIVTZ053	---TT--
B_HIV127290	--V---I	D_HIVTZ112	---TT--
B_HIV127481	--V----	D_HIV143425	---TT--
B_HIV14995	-----		
CONSENSUS-C	L--TT--	CONSENSUS-E	L--T--H
93MW959.18	L--TT--	93TH966.8	L--T--H
93MW960.3	L--TT--	93TH975.15	LK-T--H
HIVD757	L--TT--	92TH022.2	L--T--H
HIVD747	L--TT--	HIVTN243	L--T--H
HIVD760	L--TTY-	HIVTH0065	L--IT-H
		HIVTH0115	L--TT-H

CONSENSUS-B	PEIVMHS	CONSENSUS-B	PEIVMHS
HIVCARELO	---T--N	HIVCAR4081	L--TT-T
HIVCAR4017	--TTN-I	HIVZ3	I--TT-T
HIVCAR4071	L--T--H		
HIVCARMBA	L--T---	GX_HIVVI525A	L--TT--
E_92TH022.4	L--T--H	AC_HIVZAM184	L--TT--
E_HIV11643	L--T--H	AD_HIVK124A	---TT--
E_93TH976.17	L--T--H	AD_HIVUG266A	---TT--
E_HIVTN235	L--T--H	AD_HIVMAL	---TT--
E_HIVTN239	L--T--H	AE_HIVCAR4039	---T-LT
E_HIVTN241	L--T--H	BF_93BR020.10	L--T---
E_HIVTN242	L--T--H	BF_RJI01.5	-----T
E_HIVTN244	L--T--H		
CONSENSUS-F	L--T---		
HIVBRA7944	L--T---		
HIVBZ163A	L--T---		
HIVBZ126A	L--T---		
HIVCA20	L--TT--		
HIVCA16	L-VTT--		
HIVCA4	---TT--		
HIVVI354	--VT--I		
93BR019.17	L--TR-N		
93BR029.2	L--T---		
F_RJI03	L--T---		
F_HIVVI325	---T---		
CONSENSUS-G	L--TT--		
HIVLBV217	L--TA--		
HIVCAR4067	L-VTK--		
HIVJV832	L--TT--		
HIVG3	L--TT--		
HIVG9	L--TT--		
HIVJP882	L--TT--		
92RU131.9	L--TT--		
92UG975.10	L--TT--		
G_HIVRU511B	L--TT--		
G_HIVRU131	L--TT--		
G_HIVRU570	L--TA--		
G_HIV47621	L-VTTY-		
G_HIV47622	L--MT--		
CONSENSUS-H	?--??-?		
HIVCA13	I--IT-M		
HIVVI557	M--T--T		
HIVANT70	L-VTHLH		
HIVMVP5180	A-VSHLH		
HIVVAU	A-VTNFF		
HIVVI686	--VTHLH		
HIVCA9	D-TTYMH		
SIVCPZGAB	--VTH-M		
SIVCPZANT	--VKV-W		

HIV CTL Epitopes

gp120 CTL epitope 11

HLA-Cw4

CONSENSUS-B SFNCGGEFF
Epitope11 -----

CONSENSUS-A -----

HIVSF1703 -----
HIVU455 -----
HIVZ321 -----
92RW020.5 --I-----
HIVUG0314 -----
HIVD687 ----R---
HIVNI -----
HIVRW0914 -----
HIVUG06 ----V----
HIVUG275A ----R---
HIVUG273A -----
HIVVI191A -----
HIVDJ264A -----
HIVDJ263A -----
HIVDJ258A ----R---
HIVCARGAN -----
HIVCARSAAS -----
HIVCI211 -----
HIVCAR4054 ----R---
HIVCAR286A -----V-
HIVCAR4023 ----R---
HIVCAR423A ----K---
HIVKENYA -----
HIVCI31 -----
HIVCI473 -----
HIVCI451 -----
HIVCI145 -----
HIVCI3291 -----
HIVCI3263 -----
HIVCI201 --T-----
HIVCI3271 --T-----
HIVCI422 -----
HIVCI3301 N-----
92UG031.7 -----
92UG037.8 -----
A_92UG037.8 -----
A_92RW009.2 -----
A_HIVCA1 -----
A_HIVCI47 -----

CONSENSUS-B -----
HIVJRCSF -----
HIVJRFL -----
HIVALA1 -----
HIVBRVA -----

CONSENSUS-B	SFNCGGEFF
HIVJH32	-----
HIVBAL1	-----
HIVYU2	-----
HIVMN	-----
HIVHXB2R	-----
HIVLAI	-----
HIVNL43	-----
HIVMFA	-----
HIVCAM1	-----
HIVNY5CG	-----
HIVADA	-----
HIVJFL	T-----
HIVSIMI84	-----
HIVD31	-----
HIVSF162	-----
HIVBCSG3C	-----
HIVOYOI	-----
HIVSF33	----R---
HIVCDC42	-----
HIVSF2	----R---
HIVSF2B13	----R---
HIVHAN	-----
HIVRF	-----
HIVWMJ22	-----
HIVTB132	--I-W---
92BR020.4	-----
HIVTH1412	-----
92US711.14	-----
91US712.4	M-----
92US715.6	-----
92US716.6	-L-----
92HT593.1	-----
92HT594.10	-----
92HT596.4	-----
92HT599.24	--T-----
91HT651.11	-----
HIVRJS	-----
HIVGUN	T-----
HIVSC	-----
HIVSBA	-----
HIVSBB	T-----
HIVSBC	N-----
HIVJB02	--T-----
HIVJ61	--I-----
HIVBR0141	T-----
HIVTH0266	-----K--
HIVBR0216	-----A--
HIVACH9	T-----
HIVACP1	-----
HIVWM	-----
HIVMA208	-----
HIVMA1CON	-----
HIVCAN0A	-----

CONSENSUS-B	SFNCGGEFF	CONSENSUS-B	SFNCGGEFF
HIVFO	-----	HIVD1044	----R----
HIVP896	-----	HIVD1024	----R----
HIVBWB11A	-----	HIVD744	----R----
HIVCI223	T-----	HIVD766	----R----
91US006.10	-----	HIVD808	----R----
91US005.11	T-----	HIVD868	----R----
92US657.1	-----	HIVBR0255	----R----
92US714.1	-----	HIVSM145A	----R----
B_92BR028.8	T-----	HIVZAM18A	----R----
B_HIV8020	T-----	HIVDJ259A	-----
B_HIV1CM237X	-----	HIVDJ373A	-----
B_91HT652.11	-----	HIVSE364A	----R----
B_92UG005	-----	HIVUG268A	----R----
B_HIVMANC	-----	HIV1U0GOM	----R----
B_HIV3202A12	-----	HIV1BOOYD	----R----
B_HIVWEAU160	-----	92BR025.9	----R----
B_HIV141	-----	C_93MW965.26	----R----
B_HIV144	-----	CONSENSUS-D	-----
B_HIV149	-----	HIVJY1	-----
B_HIVVE1	-----	HIVNDK	ML---D--
B_HIVVE2	----R---	HIVELI	-----
B_HIVVE3	-----	HIVZ2Z6	-----
B_HIVVE4	-----	HIVUG0219	-----
B_HIVVE5	-----	HIVUG0468	-L-----
B_HIVVE6	-----	HIVUG23	----R----
B_HIVVE7	-----	HIVUG0381	-----
B_HIVVE8	-----	HIVUG269A	-----
B_HIVDI2ACD	-----	HIVUG274A	-----
B_HIVGP120	----D--	HIVSE365A	----R----
B_HIV168A	-----	HIVCAR4020	----Q----
B_HIVENVVA	-----	HIVCI132	-----
B_HIVETR	N-----	92UG024.2	-----
B_HIVRJSP3	-----	93ZR001.3	-----
B_HIVUS1	-----	D_HIV43424	-----
B_HIVUS2	-----	D_HIV143425	-----
B_HIVUS3	-----	CONSENSUS-E	H---R----
B_HIVUS4	-----	93TH966.8	H---R----
B_HIV117305	----K--	93TH975.15	H---R----
B_HIV124612	----R---	92TH022.2	H---R----
B_HIV126807	I---R----	HIVTN243	H---R----
B_HIV127290	I-----	HIVTH0065	H---R----
B_HIV127481	----R---	HIVTH0115	H---R----
B_HIV14995	----R---	HIVCARELO	N---R----
CONSENSUS-C	----R----	HIVCAR4017	I---R----
93MW959.18	----R---	HIVCAR4071	H---R----
93MW960.3	----R---	HIVCARMBA	----R----
HIVD757	----R---	E_92TH022.4	H---R----
HIVD747	----R---	E_HIV11643	H---R----
HIVD760	----R---	E_93TH976.17	H---R----
HIVNOF	----R---	E_HIVTN235	H---K----
HIVSH750	----R---	E_HIVTN239	H---R----
HIVZAM20A	----R---		

HIV CTL Epitopes

CONSENSUS-B	SFNCGGEFF	CONSENSUS-B	SFNCGGEFF
E_HIVTN241	H---R----	GX_HIVVI525A	----R----
E_HIVTN242	H---R----	AC_HIVZAM184	-----
E_HIVTN244	H---R----	AD_HIVK124A	----R----
CONSENSUS-F	----R----	AD_HIVUG266A	-----
HIVBRA7944	----R----	AD_HIVMAL	----R----
HIVBZ163A	----R----	AE_HIVCAR4039	T-----
HIVBZ126A	----R----	BF_93BR020.10	----R----
HIVCA20	----R----	BF_RJI01.5	T-----
HIVCA16	----R----		
HIVCA4	----R-K--		
HIVVI354	I---R----		
93BR019.17	N---M----		
93BR029.2	----R----		
F_RJI03	----R----		
F_HIVVI325	-----		
CONSENSUS-G	----R----		
HIVLBV217	----R----		
HIVCAR4067	-----		
HIVJV832	----R----		
HIVG3	----R----		
HIVG9	----R----		
HIVJP882	----R----		
92RU131.9	----R----		
92UG975.10	-----		
G_HIVRU511B	----R----		
G_HIVRU131	----R----		
G_HIVRU570	----R----		
G_HIV47621	----R----		
G_HIV47622	----R----		
CONSENSUS-H	?---?----		
HIVCA13	M---A----		
HIVVI557	T---R----		
HIVANT70	H---H----		
HIVMVP5180	H---H-----		
HIVVAU	F---H----		
HIVVI686	H---H----		
HIVCA9	H---H----		
SIVCPZGAB	M-----		
SIVCPZANT	W---Q----		
HIVCAR4081	T-----		
HIVZ3	T-----		

gp120 CTL epitope 12**HLA-A2**

CONSENSUS-B	SFNCGGEF
Epitope12	-----

CONSENSUS-A	-----
HIVSF1703	-----
HIVU455	-----
HIVZ321	-----
92RW020.5	--I----
HIVUG0314	-----
HIVD687	----R--
HIVNI	-----
HIVRW0914	-----
HIVUG06	----V--
HIVUG275A	----R--
HIVUG273A	-----
HIVVI191A	-----
HIVDJ264A	-----
HIVDJ263A	-----
HIVDJ258A	----R--
HIVCARGAN	-----
HIVCARSAAS	-----
HIVCI1211	-----
HIVCAR4054	----R--
HIVCAR286A	----V
HIVCAR4023	----R--
HIVCAR423A	----K--
HIVKENYA	-----
HIVCI131	-----
HIVCI1473	-----
HIVCI1451	-----
HIVCI145	-----
HIVCI3291	-----
HIVCI3263	-----
HIVCI201	--T----
HIVCI3271	--T----
HIVCI422	-----
HIVCI3301	N-----
92UG031.7	-----
92UG037.8	-----
A_92UG037.8	-----
A_92RW009.2	-----
A_HIVCA1	-----
A_HIVCI47	-----

CONSENSUS-B	-----
HIVJRCFSF	-----
HIVJRFL	-----
HIVALAI1	-----
HIVBRVA	-----

CONSENSUS-B	SFNCGGEF
HIVJH32	-----
HIVBAL1	-----
HIVYU2	-----
HIVMN	-----
HIVHXB2R	-----
HIVLAI	-----
HIVNL43	-----
HIVMFA	-----
HIVCAM1	-----
HIVNY5CG	-----
HIVADA	-----
HIVJFL	T-----
HIVSIMI84	-----
HIVD31	-----
HIVSF162	-----
HIVBCSG3C	-----
HIVOYI	-----
HIVSF33	---R--
HIVCDC42	-----
HIVSF2	---R--
HIVSF2B13	---R--
HIVHAN	-----
HIVRF	-----
HIVWMJ22	-----
HIVTB132	--I-W--
92BR020.4	-----
HIVTH1412	-----
92US711.14	-----
91US712.4	M-----
92US715.6	-----
92US716.6	-L-----
92HT593.1	-----
92HT594.10	-----
92HT596.4	-----
92HT599.24	--T----
91HT651.11	-----
HIVRJS	-----
HIVGUN	T-----
HIVSC	-----
HIVSBA	-----
HIVSBB	T-----
HIVSBC	N-----
HIVJB02	--T----
HIVJ61	--I-----
HIVBR0141	T-----
HIVTH0266	-----K-
HIVBR0216	---A---
HIVACH9	T-----
HIVACP1	-----
HIVWM	-----
HIVMA208	-----
HIVMA1CON	-----
HIVCAN0A	-----

HIV CTL Epitopes

CONSENSUS-B	SFNCGGEF	CONSENSUS-B	SFNCGGEF
HIVFO	-----	HIVD1044	----R---
HIVP896	-----	HIVD1024	----R---
HIVBWB11A	-----	HIVD744	----R---
HIVCI223	T-----	HIVD766	----R---
91US006.10	-----	HIVD808	----R---
91US005.11	T-----	HIVD868	----R---
92US657.1	-----	HIVBR0255	----R---
92US714.1	-----	HIVSM145A	----R---
B_92BR028.8	T-----	HIVZAM18A	----R---
B_HIV8020	T-----	HIVDJ259A	-----
B_HIV1CM237X	-----	HIVDJ373A	-----
B_91HT652.11	-----	HIVSE364A	----R---
B_92UG005	-----	HIVUG268A	----R---
B_HIVMANC	-----	HIV1U0GOM	----R---
B_HIV3202A12	-----	HIV1BOYD	----R---
B_HIVWEAU160	-----	92BR025.9	----R---
B_HIV141	-----	C_93MW965.26	----R---
B_HIV144	-----		
B_HIV149	-----	CONSENSUS-D	-----
B_HIVVE1	-----	HIVJY1	-----
B_HIVVE2	---R---	HIVNDK	ML----D-
B_HIVVE3	-----	HIVELI	-----
B_HIVVE4	-----	HIVZ2Z6	-----
B_HIVVE5	-----	HIVUG0219	-----
B_HIVVE6	-----	HIVUG0468	-L-----
B_HIVVE7	-----	HIVUG23	---R---
B_HIVVE8	-----	HIVUG0381	-----
B_HIVDI2ACD	-----	HIVUG269A	-----
B_HIVGP120	----D-	HIVUG274A	-----
B_HIV168A	-----	HIVSE365A	---R---
B_HIVENVVA	-----	HIVCAR4020	---Q---
B_HIVETR	N-----	HIVCI132	-----
B_HIVRJSP3	-----	92UG024.2	-----
B_HIVUS1	-----	93ZR001.3	-----
B_HIVUS2	-----	D_HIV43424	-----
B_HIVUS3	-----	D_HIV143425	-----
B_HIVUS4	-----		
B_HIV117305	----K-	CONSENSUS-E	H---R---
B_HIV124612	---R---	93TH966.8	H---R---
B_HIV126807	I---R---	93TH975.15	H---R---
B_HIV127290	I-----	92TH022.2	H---R---
B_HIV127481	---R---	HIVTN243	H---R---
B_HIV14995	---R---	HIVTH0065	H---R---
		HIVTH0115	H---R---
CONSENSUS-C	----R---	HIVCARELO	N---R---
93MW959.18	---R---	HIVCAR4017	I---R---
93MW960.3	---R---	HIVCAR4071	H---R---
HIVD757	---R---	HIVCARMBA	----R---
HIVD747	---R---	E_92TH022.4	H---R---
HIVD760	---R---	E_HIV11643	H---R---
HIVNOF	---R---	E_93TH976.17	H---R---
HIVSH750	---R---	E_HIVTN235	H---K---
HIVZAM20A	---R---	E_HIVTN239	H---R---

CONSENSUS-B	SFNCGGEF	CONSENSUS-B	SFNCGGEF
E_HIVTN241	H---R---	GX_HIVVI525A	----R---
E_HIVTN242	H---R---	AC_HIVZAM184	-----
E_HIVTN244	H---R---	AD_HIVK124A	----R---
CONSENSUS-F	----R---	AD_HIVUG266A	-----
HIVBRA7944	----R---	AD_HIVMAL	----R---
HIVBZ163A	----R---	AE_HIVCAR4039	T-----
HIVBZ126A	----R---	BF_93BR020.10	---R---
HIVCA20	----R---	BF_RJI01.5	T-----
HIVCA16	----R---		
HIVCA4	----R-K-		
HIVVI354	I---R---		
93BR019.17	N---M---		
93BR029.2	----R---		
F_RJI03	----R---		
F_HIVVI325	-----		
CONSENSUS-G	----R---		
HIVLBV217	----R---		
HIVCAR4067	-----		
HIVJV832	----R---		
HIVG3	----R---		
HIVG9	----R---		
HIVJP882	----R---		
92RU131.9	----R---		
92UG975.10	-----		
G_HIVRU511B	----R---		
G_HIVRU131	----R---		
G_HIVRU570	----R---		
G_HIV47621	----R---		
G_HIV47622	----R---		
CONSENSUS-H	?---?---		
HIVCA13	M---A---		
HIVVI557	T---R---		
HIVANT70	H---H---		
HIVMVP5180	H---H---		
HIVVAU	F---H---		
HIVVI686	H---H---		
HIVCA9	H---H---		
SIVCPZGAB	M-----		
SIVCPZANT	W---Q---		
HIVCAR4081	T-----		
HIVZ3	T-----		

HIV CTL Epitopes

gp120 CTL epitope 13

HLA-DR4, CD4+CTL

CONSENSUS-B **LPCRIKQIINMWQE**
Epitope13 **-----F-----**

CONSENSUS-A **-Q-----V----R**

HIVSF1703 -----R
HIVU455 -Q-----R
HIVZ321 -----V---R
92RW020.5 -T-----K
HIVUG0314 ---K-----R
HIVD687 HQ-----V---K
HIVNI -Q-----V---K
HIVRW0914 -----C-R
HIVUG06 -----R--RI--R
HIVUG275A -Q-----R
HIVUG273A -Q-----R
HIVVI191A -----VR---R
HIVDJ264A -Q-----V---K
HIVDJ263A -Q-----V---K
HIVDJ258A -Q-----V---K
HIVCARGAN -Q-----V---R
HIVCARSAAS -----VR---R
HIVCI211 -Q-----V---R
HIVCAR4054 -Q-----R---R
HIVCAR286A -----V-I--R
HIVCAR4023 -----V---R
HIVCAR423A -----VH---R
HIVKENYA -----R
HIVCI31 -Q-----VK---K
HIVCI473 -Q-----V---K
HIVCI451 -Q-K---V---K
HIVCI145 -Q-----VR---G
HIVCI3291 -Q-----VR---T
HIVCI3263 FQ-----V---R
HIVCI201 -Q-----V---R
HIVCI3271 -Q-----K
HIVCI422 -----R--VK---R
HIVCI3301 -----VH---R
92UG031.7 ---K-----R
92UG037.8 -----R
A_92UG037.8 -----R
A_92RW009.2 -----S---R
A_HIVCA1 -Q-----V---R
A_HIVCI47 -Q-----V---K

CONSENSUS-B -----
HIVJRCSF -----
HIVJRF'L -----
HIVALA1 -----V---
HIVBRVA -----
HIVJH32 -----
HIVBAL1 -----
HIVYU2 -----
HIVMN -Q-K-----

CONSENSUS-B **LPCRIKQIINMWQE**

HIVHXB2R -----K
HIVLAI -----F-----
HIVNL43 -----F-----
HIVMFA -----F-----
HIVCAM1 -----R---
HIVNY5CG -----R---
HIVADA -----
HIVJFL -----R---
HIVSIM184 -L-----R---
HIVD31 -----
HIVSF162 -----R---
HIVBCSG3C -----
HIVOYOI -----V---
HIVSF33 -----
HIVCDC42 -----R--V
HIVSF2 -----
HIVSF2B13 -----
HIVHAN -----
HIVRF -----V---
HIVWMJ22 -----G
HIVTB132 -----V---
92BR020.4 -----VD---
HIVTH1412 -----V---
92US711.14 -----R---V--K
91US712.4 -Q-----
92US715.6 -----V---
92US716.6 -Q-----Q
92HT593.1 -----
92HT594.10 -----V---
92HT596.4 -----V---
92HT599.24 -----V---R
91HT651.11 -----
HIVRJS -----R---
HIVGUN -Q-----S---
HIVSC -----E-----
HIVSBA -----V---
HIVSBB -Q-----V---
HIVSBC -----
HIVJB02 -----
HIVJ61 -----
HIVBR0141 -----R---
HIVTH0266 -----V---
HIVBR0216 -----
HIVACH9 -----
HIVACP1 -----
HIVJM -----
HIVWM -----
HIVMA208 -Q-----F--L--K
HIVMA1CON -Q-----F--L--K
HIVCAN0A -----V---
HIVFO -----F-----G
HIVP896 -Q-----K
HIVBWB11A -----
HIVCI223 -----
91US006.10 -----F---
91US005.11 -----
92US657.1 -----

CONSENSUS-B	LPCRIKQIINMWQE	CONSENSUS-B	LPCRIKQIINMWQE
92US714.1	-----	HIV1U0GOM	-Q-----G
B_92BR028.8	-----R--	HIV1BOOYD	--S-----L-L-
B_HIV8020	----R-FV-L---	92BR025.9	I-----G
B_HIV1CM237X	-----V----	C_93MW965.26	-----G
B_91HT652.11	-----		
B_92UG005	-Q-----G		
B_HIVMANC	-----L-L--	CONSENSUS-D	-----G
B_HIV3202A12	-----G	HIVJY1	-----G
B_HIVWEAU160	-----R--	HIVNDK	-----V-L--R
B_HIV141	-----V--	HIVELI	-Q-----K-VAG
B_HIV144	-Q-----V--	HIVZ2Z6	-Q-----G
B_HIV149	-----	HIVUG0219	-----G
B_HIVVE1	-Q-----V--	HIVUG0468	-----G
B_HIVVE2	-----VR--	HIVUG23	-----R
B_HIVVE3	-----L--	HIVUG0381	I---R----L---
B_HIVVE4	-Q-----	HIVUG269A	-----
B_HIVVE5	-----V-L--	HIVUG274A	-Q-----
B_HIVVE6	-G-----L--	HIVSE365A	-----L--R
B_HIVVE8	-----V--	HIVCAR4020	----R---R---R
B_HIVDI2ACD	----R-----K	HIVCI132	-----V---R
B_HIVGP120	I-----G	92UG024.2	--K---V---G
B_HIV168A	-Q-K-R--V-L--Q	93ZR001.3	I-----G
B_HIVENVVA	-----	D_HIV43424	-Q-----
B_HIVETR	-----V--	D_HIV143425	-Q----L--L--G
B_HIVRJSP3	-S-----K--		
B_HIVUS1	-Q-----	CONSENSUS-E	---K-----G
B_HIVUS2	-----R--	93TH966.8	---K-----G
B_HIVUS3	-----R---R--	93TH975.15	---K-----G
B_HIVUS4	-----S----C--	92TH022.2	---K-----G
B_HIV117305	-----	HIVTN243	---K-----G
B_HIV124612	-----	HIVTH0065	---K---V---C-G
B_HIV126807	-----F---G	HIVTH0115	---K-----G
B_HIV127290	-----	HIVCARELO	-----G---G
B_HIV127481	-Q-----	HIVCAR4017	----R---V---R
B_HIV14995	-----	HIVCAR4071	----V-K---
		HIVCARMBA	-----V---G
CONSENSUS-C	-----	E_92TH022.4	---K-----G
93MW959.18	-----	E_HIV11643	---K-----G
93MW960.3	-----	E_93TH976.17	---K---V---G
HIVD757	IQ-----	E_HIVTN235	---K-----G
HIVD747	I-----	E_HIVTN239	---K-----G
HIVD760	I-----V-L--	E_HIVTN241	---K-----G
HIVNOF	-----	E_HIVTN242	-HA-LN-----G
HIVSH750	-----	E_HIVTN244	---K-----G
HIVZAM20A	I---N-----		
HIVD1044	I-----	CONSENSUS-F	-----V----
HIVD1024	IL-S---V----	HIVBZ163A	-L-----MV----
HIVD744	I-----C--	HIVBZ126A	-L---R---V----
HIVD766	I-----	HIVCA20	-----FV---R
HIVD808	I-----	HIVCA16	-FW-K-R-FV----
HIVD868	IL-----VV	HIVCA4	--K-R-FV---R
HIVSM145A	-Q-----	HIVVI354	---R---V---R
HIVZAM18A	-----G	93BR019.17	-----V----
HIVDJ259A	-Q-----	93BR029.2	-----V----
HIVDJ373A	-Q-----	F_RJI03	-----V----
HIVSE364A	IQ-----G	F_HIVVI325	-----
HIVUG268A	-----G		

HIV CTL Epitopes

CONSENSUS-B	LPCRIKQIINMWQE
CONSENSUS-G	-----VR---R
HIVLBV217	-----VR---R
HIVCAR4067	-Q-----VK---R
HIVJV832	---K---VR---K
HIVG3	---K---VR---R
HIVG9	-----VR---K
HIVJP882	-----VR---K
92RU131.9	-----R---R
92UG975.10	---K---VR---R
G_HIVRU511B	-----R---R
G_HIVRU131	-----I---R
G_HIVRU570	-----VR---R
G_HIV47621	-----VR---R
G_HIV47622	---K---VR---R
CONSENSUS-H	-?-----??-R
HIVCA13	-Q-----VS---R
HIVVI557	-----R
HIVANT70	---KLR-VVRS-IR
HIVMVP5180	I--KLR-LVRS-MK
HIVVAU	I---LR-VVRD-MR
HIVVI686	I---L--VVRS-MR
HIVCA9	I---L--VVRS-MR
SIVCPZGAB	----R--VSS-MR
SIVCPZANT	AH-----V-H-GI
HIVCAR4081	---K-R--VR---K
HIVZ3	-----VVRT--G
GX_HIVVI525A	-Q-K---VR---R
AC_HIVZAM184	-----R
AD_HIVK124A	---K-----
AD_HIVUG266A	---K-----L--G
AD_HIVMAL	-----K
AE_HIVCAR4039	---K-R-NV---R
BF_93BR020.10	-----V-----
BF_RJI01.5	-----K

gp120 CTL epitope 14**HLA-2, murine H2 a, b, f**

CONSENSUS-B	KQIINMWQEVGKAMY
Epitope14	--F-----
Epitope-alt	-----A

CONSENSUS-A	----V----R--Q---
HIVSF1703	-----R--Q---
HIVU455	-----R--Q---
HIVZ321	---V---R--Q---
92RW020.5	-----K--Q---
HIVUG0314	-----R-EQ---
HIVD687	---V---K--Q---
HIVNI	---V---K--Q---
HIVRW0914	-----C-RT-Q---
HIVUG06	R---RI--RT-Q-T-
HIVUG275A	-----RA---I-
HIVUG273A	-----R--R---
HIVVI191A	---VR---R--Q---
HIVDJ264A	---V---K--R---
HIVDJ263A	---V---K--L---
HIVDJ258A	---V---K---I-
HIVCARGAN	---V---RA-Q---
HIVCARSAAS	---VR---R-----
HIVCI1211	---V---RA-Q-I-
HIVCAR4054	---R---R--Q---
HIVCAR286A	---V-I--R--Q---
HIVCAR4023	---V---R--Q---
HIVCAR423A	---VH---R--Q---
HIVKENYA	- . -----RA-Q---
HIVCI31	---VK---K-----
HIVCI473	---V---K--Q---
HIVCI451	---V---K--Q---
HIVCI145	---VR---G--Q---
HIVCI3291	---VR---T--Q---
HIVCI3263	---V---R--Q---
HIVCI201	---V---R--Q---
HIVCI3271	-----K--Q---
HIVCI422	R--VK---R--Q---
HIVCI3301	---VH---R--Q---
92UG031.7	-----R-EQ---
92UG037.8	-----R--Q-I-
A_92UG037.8	-----R--Q-I-
A_92RW009.2	----S---RT-Q---
A_HIVCA1	---V---R--Q---
A_HIVCI47	---V---K--Q---

CONSENSUS-B	-----
HIVJRCNF	-----
HIVJRFL	-----
HIVALA1	---V-----

CONSENSUS-B

KQIINMWQEVGKAMY	-----
HIVBRVA	-----
HIVJH32	-----
HIVBAL1	-----R
HIVYU2	-----
HIVMN	-----
HIVHXB2R	-----K
HIVLAI	---F-----
HIVNL43	---F-----
HIVMFA	---F-----
HIVCAM1	-----R
HIVNY5CG	-----R
HIVADA	-----
HIVJFL	-----R
HIVSIMI84	-----R
HIVD31	-----
HIVSF162	-----R
HIVBCSG3C	-----
HIVOYI	---V-----
HIVSF33	-----
HIVCDC42	-----R-V-----
HIVSF2	-----
HIVSF2B13	-----
HIVHAN	-----
HIVRF	---V-----
HIVWMJ22	-----G
92BR020.4	---VD-----S
HIVTH1412	---V-----
92US711.14	R---V--K-----
91US712.4	-----
92US715.6	---V-----
92US716.6	-----Q
92HT593.1	-----
92HT594.10	---V-----
92HT596.4	---V-----
92HT599.24	---V---R-----
91HT651.11	-----
HIVRJS	-----R
HIVGUN	-----S
HIVSC	---E-----
HIVSBA	---V-----
HIVSBB	---V-----
HIVSBC	-----
HIVJB02	-----
HIVJ61	-----
HIVBR0141	-----R
HIVTH0266	---V-----
HIVBR0216	-----
HIVACH9	-----
HIVACP1	-----
HIVJM	---V-----
HIVWM	-----
HIVMA208	---F--L--K-----
HIVMA1CON	---F--L--K-----

HIV CTL Epitopes

CONSENSUS-B	KQIINMWQEVGKAMY	CONSENSUS-B	KQIINMWQEVGKAMY
HIVCAN0A	---V-----	HIVD1044	-----R---
HIVFO	--F-----G-----	HIVD1024	---V-----R---
HIVP896	-----K-----	HIVD744	-----C---R---
HIVBWB11A	-----	HIVD766	-----R---
HIVCI223	-----	HIVD808	-----R---
91US006.10	--F-----	HIVD868	--VV-----R---
91US005.11	-----	HIVSM145A	-----Q---
92US657.1	-----	HIVZAM18A	-----G---Q---
92US714.1	-----	HIVDJ259A	-----R---
B_92BR028.8	-----R-----	HIVDJ373A	-----R---
B_HIV8020	R-FV-L-----	HIVSE364A	-----G---R-I-
B_HIV1CM237X	--V-----	HIVUG268A	-----G---R---
B_91HT652.11	-----	HIV1U0GOM	-----G---Q---
B_92UG005	-----G-----	HIV1BOOYD	-----L-L---R---
B_HIVMANC	--L-L-----	92BR025.9	-----G---R---
B_HIV3202A12	-----G-----	C_93MW965.26	-----G---R---
B_HIVWEAU160	-----R-----		
B_HIV141	--V-----	CONSENSUS-D	-----G-----
B_HIV144	--V-----	HIVJY1	-----G-----
B_HIV149	-----	HIVNDK	--V-L--R-----
B_HIVVE1	--V-----	HIVELI	---K-VAG.R---I-
B_HIVVE2	--VR-----	HIVZ2Z6	-----G-----
B_HIVVE3	-----L-----	HIVUG0219	-----G-----
B_HIVVE4	-----	HIVUG0468	-----G-----
B_HIVVE5	--V-L---Q---	HIVUG23	-----R-----
B_HIVVE6	-----L-----	HIVUG0381	R----L-----
B_HIVVE8	--V-----	HIVUG269A	-----
B_HIVDI2ACD	R-----K-----	HIVUG274A	-----
B_HIVGP120	-----G-----	HIVSE365A	-----L-R-----
B_HIV168A	R--V-L--Q-----	HIVCAR4020	R---R---R---Q---
B_HIVENVVA	-----	HIVCI132	--V---R-----
B_HIVETR	--V-----	92UG024.2	--V---G-----
B_HIVRJSP3	----K-----	93ZR001.3	-----G-----
B_HIVUS1	-----	D_HIV43424	-----
B_HIVUS2	-----R-----	D_HIV143425	--L---L---G---Q---
B_HIVUS3	R---R-----		
B_HIVUS4	S----C----P--	CONSENSUS-E	-----GA-Q---
B_HIV117305	-----	93TH966.8	-----GA-L---
B_HIV124612	-----	93TH975.15	-----GA-Q---
B_HIV126807	--F-----G-----	92TH022.2	-----GA-Q---
B_HIV127290	-----	HIVTN243	-----GA-Q---
B_HIV127481	-----	HIVTH0065	--V--C-GA-Q---
B_HIV14995	-----	HIVTH0115	-----G---Q---
		HIVCARELO	--G---G---R---
CONSENSUS-C	-----R---	HIVCAR4017	R--V---R---Q---
93MW959.18	-----R---	HIVCAR4071	--V-K-----Q---
93MW960.3	-----R---	HIVCARMBA	--V---G---Q---
HIVD757	-----R---	E_92TH022.4	-----GA-Q---
HIVD747	-----R---	E_HIV11643	-----G---Q---
HIVD760	--V-L---R---	E_93TH976.17	--V---GA-Q---
HIVNOF	-----RTSM	E_HIVTN235	-----GA-Q---
HIVSH750	-----R---	E_HIVTN239	-----GA-Q---
HIVZAM20A	N-----	E_HIVTN241	-----GA-Q---

CONSENSUS-B	KQIINMWQEVGKAMY
E_HIVTN242	N-----GA-QP--
E_HIVTN244	-----GA-Q---
 CONSENSUS-F	 ----V-----R---
HIVBZ163A	--MV-----R---
HIVBZ126A	R--V-----R---
HIVCA20	--FV---R--Q---
HIVCA16	R-FV-----
HIVCA4	R-FV---R--R---
HIVVI354	R--V---R--R---
93BR019.17	---V-----R---
93BR029.2	---V-----R---
F_RJI03	---V-----R---
F_HIVVI325	-----
 CONSENSUS-G	 ---VR---R--Q---
HIVLBV217	---VR---R--Q---
HIVCAR4067	---VK---RT-Q---
92RU131.9	----R---R--Q---
92UG975.10	---VR---R--Q---
G_HIVRU511B	----R---R--Q---
G_HIVRU131	----I---R--Q---
G_HIVRU570	---VR---R--Q---
G_HIV47621	---VR---R--Q---
G_HIV47622	---VR---R--Q---
 CONSENSUS-H	 ----?----R?-Q---
HIVCA13	---VS---RA-Q---
HIVVI557	-----R--Q---
 HIVANT70	R-VVRS-IRGQSQL-
HIVMVP5180	R-LVRS-MKGESRI-
HIVVAU	R-VVRD-MRG-SGL-
HIVVI686	--VVRS-MRG-SGL-
HIVCA9	--VVRS-MRG-SGL-
 SIVCPZGAB	R--VSS-MR--RGI-
SIVCPZANT	---V-H-GI-S-GI-
 HIVCAR4081	R--VR---K--Q---
HIVZ3	--VVRT--G--Q---
 GX_HIVVI525A	---VR---R--Q---
AC_HIVZAM184	-----R--R---
AD_HIVK124A	-----R--R---
AD_HIVUG266A	----L--G--T---
AD_HIVMAL	-----KT----
AE_HIVCAR4039	R-NV---R-----
BF_93BR020.10	---V-----R---
BF_RJI01.5	-----K--R---

HIV CTL Epitopes

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gp41 CTL Epitopes

CTL gp41 Epitopes

NOV95

Location	Epitope Comments	Antigen	Species(HLA)	Reference
gp41(572-590 BRU)	GIKQLQARILAVERYLKDQ CD4+ CTL; I(9) to V and K(17) to R blocks T cell receptor binding	rgp160 BRU vaccine	human(DPw4.2)	[Hammond (1991)]
gp41(575-599 IIIB)	QLQARILAVERYLKDQQQLLGIGC Epitope recognized by CTL clone derived from CSF	HIV-1 infection	human(B14)	[Jassoy (1992)]
gp41(583-592 PV22)	VERYLKDDQQL HIV-1 specific CTLs release γ -IFN, and α - and β -TNF	HIV-1 infection	human(B14)	[Jassoy (1993)]
gp41(584-592)	ERYLKDDQQL Study of cytokines released by HIV-1 specific activated CTL	HIV-1 infection	human(?)	[Price (1995)]
gp41(584-592 HXB2)	ERYLKDDQQL Detailed study of T cell receptor usage	HIV-1 infection	human(B14)	[Kalams (1994)]
gp41(584-592 PV22)	ERYLKDDQQL Two overlapping CTL epitopes with different HLA restriction	HIV-1 infection	human(B14)	[Johnson (1992)]
gp41(584-592 PV22)	ERYLKDDQQL HIV-1 specific CTLs release γ -IFN, and α - and β -TNF	HIV-1 infection	human(B14)	[Jassoy (1993)]
gp41(584-592,HXB2)	ERYLKDDQQL Longitudinal study of T cell receptor usage in a single individual	HIV-1 infection	human(B14)	[Kalams (1994)]
gp41(584-592)	ERYLKDDQQL Epitope studied in the context of HLA B14 binding		human(B14)	[DiBrino (1994a)]
gp41(584-592)	ERYLKDDQQL This peptide can be processed for HLA-B14 presentation in a TAP-1/2 independent pathway		human(B14)	[Hammond (1995)]
gp41(586-593)	YLKDQQQL Two overlapping CTL epitopes with different HLA restriction	HIV-1 infection	human(B8)	[Johnson (1992)]
gp41(586-593)	YLKDQQQL Predicted epitope based on B8 binding motifs, from larger peptide QLQARILAVERYLKDQQQLLGIGC		human(B8)	[Sutton (1993)]
gp41(584-591 NL43)	YLKDQQQL The lysine (K) is critical for eliciting a HLA A24 CTL response	HIV-1 infection	human(A24)	[Dai (1992)]

CTL gp41 Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
gp41(605-615 LAI)	TAVPWNASW Epitope for vaccine induced CD8+ clone	gp160 vaccinia	human(B35)	[Johnson (1994b)]
gp41(606-614 LAI)	TAVPWNASW HLA restricted CTL response to epitope in HIV-1 vaccinia-env vaccinees	gp160 vacc vaccine	human(B35)	[Johnson (1994a)]
gp41(606-614 LAI)	TAVPWNASW Peptide processed by a TAP-1/2-dependent pathway only		human(B35)	[Hammond (1995)]
gp41(701-720 BH10)	VLSIVNRVRQGYSPLSFQTH Recognized by CTL derived from acute seroconvertor	HIV-1 infection	human(A32)	[Safrit (1994a)]
gp41(747-755)	RLVNGSLAL Studied in the context of HLA A2 peptide binding	HIV-1 infection	human(A2)	[Parker (1992)]
gp41(606-614 LAI)	SYHRLRDLLLIVTR Peptide processed by a TAP-1/2-dependent pathway only		human(A31)	[Hammond (1995)]
gp41(769-777 BH10)	HRLRDLLLI Recognized by CTL derived from acute seroconvertor	HIV-1 infection	human(?)	[Safrit (1994a)]
gp41(768-778 NL43)	RLRDLLLIVTR CD8+ T cell clone; not cross-reactive with MN	HIV-1 infection	human(A3.1)	[Takahashi (1991)]
gp41(770-780 BH10)	RLRDLLLIVTR Recognized by CTL derived from acute seroconvertor	HIV-1 infection	human(A31)	[Safrit (1994a), Safrit (1994b)]
gp41(788-809 HXB2)	IVELLGRRGWEALKYWWNLLQY CTL epitope defined by T cell line, not clones, and peptide mapping	HIV-1 infection	human(B27)	[Lieberman (1992)]
gp41(791-799 LAI)	GRRGWEALK Review of HIV CTL epitopes; defined by B27 motif found within a larger peptide	HIV-1 infection	human(B27)	[McMichael & Walker(1994)]

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CTL gp41 Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
gp41(802-823 HXB2)	YWWNLLQYWSQELKNSAVNLLN CTL epitope defined by T cell line, not clones, and peptide mapping	HIV-1 infection	human(?)	[Lieberman (1992)]
gp41(814-823 LAI)	SLLNATDIAV Of two CTL clones, one reacted only with 815-823, the other with 814-823 and 815-823	MN rec gp160	human(A2)	[Dupuis (1995)]
gp41(834-848 IIIB)	DRVIEVVQGAYRAIR In a murine system multiple class I molecules can present to CTL	vaccinia IIIB gp160	murine(H-2 ^{d,p,u,q})	[Shirai (1992)]
gp41(834-848 IIIB)	DRVIEVVQGAYRAIR Helper and cytotoxic T cells can be stimulated by this peptide (Th4)	HIV-1 infection	human(A2)	[Clerici (1991)]
gp41(829-837 LAI)	RVIEVLQRA CTL from HLA-A2 positive subject react with this peptide; peptide binds to HLA A*0201 with high affinity	MN rec gp160	human(A2?)	[Dupuis (1995)]
gp41(831-853)	IEVVQGAYRAIRHIPRRIRQGLERI Study of cytokines released by HIV-1 specific activated CTL	HIV-1 infection	human(?)	[Price (1995)]
gp41(844-863 HXB2)	YRAIRHIPRRIRQGLERILL CTL epitope defined by T cell line, not clones, and peptide mapping		human(B8)	[Lieberman (1992)]
gp41(848-856 LAI)	IPRRIRQGL Unpublished, B. Wilkens		human(B7)	[Brander & Walker(1995)]
gp41(852-863 HXB2)	RRIRQGLERILL CTL epitope defined by T cell line, not clones, and peptide mapping	HIV-1 infection	human(A30,B8)	[Lieberman (1992)]

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gp41 CTL-EPITOPES

1	AVGMLGAMFLGFLGAAGSTMGAASMTLTVQARLLSGIVQQQNNLLRAIE	50
51	AQQHLFELTVW GIKQLQARVLAVERYLKDKQQLLGIGWGCSGKLICTTTVPW	100
101	NASWSNRSQDYIWNNTWMEWEREINNYTGLIYNLIESQNQQEKNEQEL	150
151	LELDKWASLWTWFDISNWLWYIKIFIMIVGGLIGLIRIVFT VLSIVNRVRQ	200
201	GYSPLSFQTHLPAPRGDRPEGIEEEGGERDRDRSGRLVDGFLTLIWVDL	250
251	RSLCLFLYHRLIDLLLIAKRIVELLGRRGWEALKYCWNLLQYWSQELKNS	300
301	AV SLLNATAIAAVAEGTDRVIEIVQRTCRAILHIPRRIQGLERALL	346.

HIV CTL Epitopes

Epitopes and protein variability:

This plot shows a score that is a measure of variability for each position in the gp41 protein alignment, and the relative positions of regions with defined CTL epitopes as seen on the CTL epitope map. The solid lines are positions where the most common character in a gp41 protein alignment is an amino acid; the dashed lines represent regions where the most common character is an insertion (dash) incorporated to maintain the alignments. The alignment used corresponds to the 1995 gp41 protein alignment, publically available at the Human Retroviruses and AIDS database, totaling 98 sequences. See the "how to use the CTL section" information for more details on the variability measure. The higher scores indicate more variation; 0 is perfectly conserved. The different protein alignments (gp120, gp41, p24, p15, p17, Nef and RT) used to create these plots contain different sets of sequences; therefore each plot is internally consistent, but cannot be compared to other protein plots.

Most common amino acid in each position in the gp41 protein is shown below. The numbering corresponds to the numbering in the variability plot for the gp41 protein.

gp41 CONSENSUS:

AVG-IGAMFLGFLGAAGSTMGAASITLTQARQLLSGIVQQQNLLRAIE 50

AQQHLLQLTVWGIKQLQARVLAVERYLKDQQLLGIVGCSGKLICTTAVPW 100

NSSWSNKSLEEIWDNMTWMEWEREIDNYTGLIYTLIEESQNQQEKNEQEL 150

LELDKWASLWNWFDTINWLWYIKIFIMIVGGGLIGLRLIVFAVLSIVNRVRQ 200

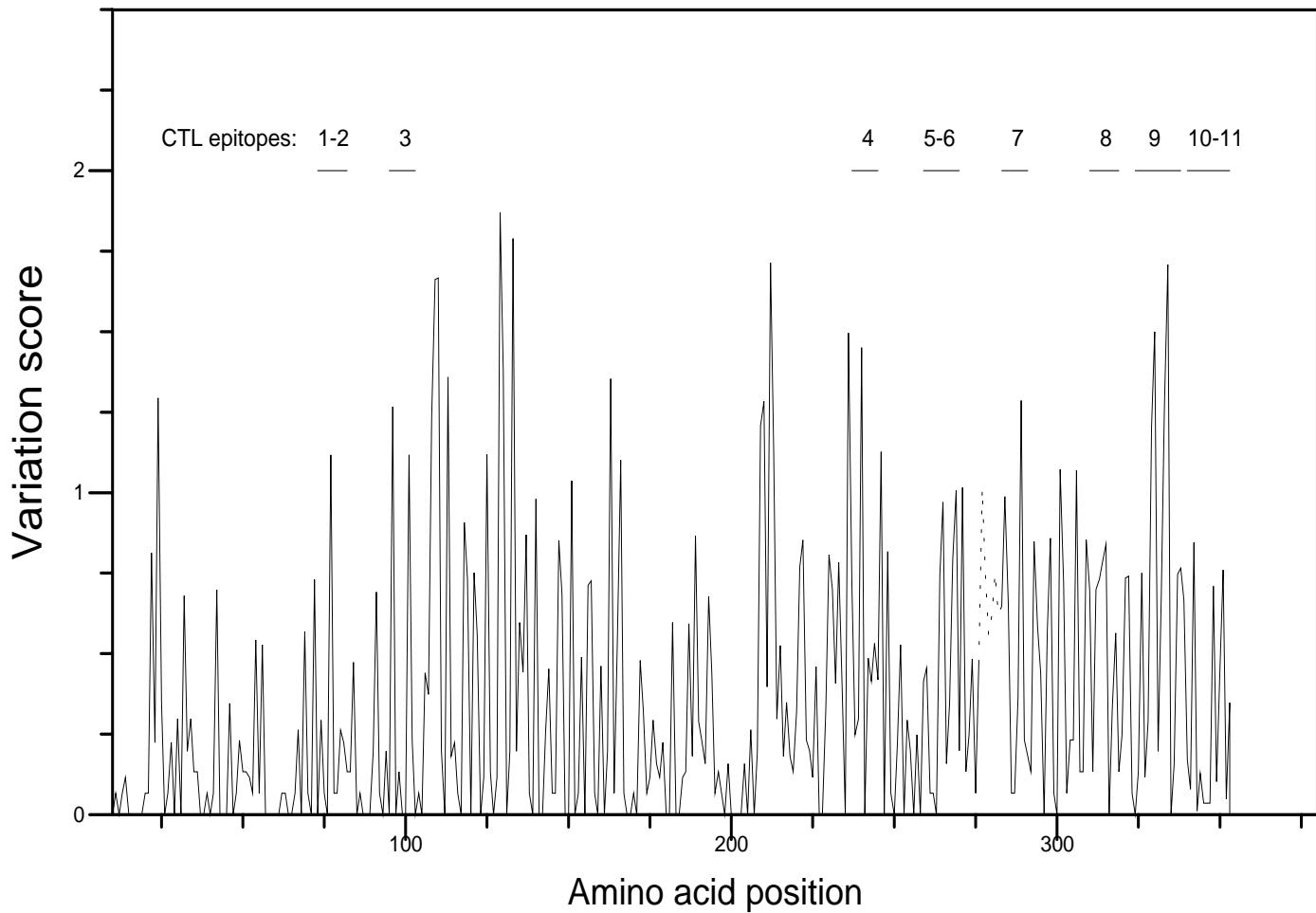
GYSPSLSFQTLLPAPRG-PDRPEGIEEEGGERDRDRSIRLVNGFLALIWDD 250

LRSLCLFSYHRLRDLLLIVARIVELLG-----RRGWEALKYLWNLLQY 300

WSQELKNSAVSLLNATAIAVAEGTDRVIEVVQRAGRAILHIPRRIHQGLE 350

RALL

Variation in positions in the gp41 protein



HIV CTL Epitopes

gp41 CTL epitope 1

HLA-B14

CONSENSUS-B ERYLKDQQL
Epitope1 -----

CONSENSUS-A ----R----
 HIVSF1703 -----
 HIVU455 ----Q----
 HIVZ321 -----
 92RW020.5 -----
 HIVUG0314 ----R----
 HIVD687 -----
 HIVUG275A ----R----
 HIVUG273A ----R----
 HIVVII191A ----R----
 HIVDJ264A ----R----
 HIVDJ263A -S--R----
 HIVDJ258A -S--R----
 HIVKENYA ----R----
 92UG031.7 ----R----
 92UG037.8 ----R----
 A_92UG037.8 ----R----

CONSENSUS-B -----
 HIVJRCSF -----
 HIVJRF1L -----G----
 HIVALA1 -----R----
 HIVBRVA -----
 HIVJH32 -----
 HIVBAL1 ----R----
 HIVYU2 ----R----
 HIVMN -----
 HIVHXB2R -----
 HIVLAI -----
 HIVNL43 -----
 HIVMFA -----
 HIVCAM1 -----
 HIVNY5CG -----
 HIVADA ----R----
 HIVJFL ----Q----
 HIVSIMI84 -----
 HIVD31 ----R----
 HIVSF162 -----
 HIVBCSG3C -----
 HIVOYI -----
 HIVSF33 ----R----
 HIVCDC42 -----
 HIVSF2 ----R----
 HIVSF2B13 ----R----
 HIVHAN ----R----
 HIVRF ----R----

CONSENSUS-B	ERYLKDQQL
HIVWMJ22	-----R---
HIVTB132	-----
92BR020.4	----G----
HIVTH1412	-----
92US711.14	-----
91US712.4	-----
92US715.6	----R----
92US716.6	-----
92HT593.1	-----
92HT594.10	-----
92HT596.4	-----
92HT599.24	-----
91HT651.11	-----
HIVRJS	-----
HIVGUN	--F-R----
HIVSC	----R----
HIVSBA	----R----
HIVSBB	-----
HIVSBC	----R----
HIVP896	----R----
91US006.10	----Q----
91US005.11	----R----
92US657.1	-----
92US714.1	----R----
B_HIV1CM237X	-----
B_91HT652.11	---P----
B_92UG005	-S-----
B_HIVMANC	----Q----
B_HIV3202A12	-----
B_HIVWEAU160	-----
B_HIV168A	-----
B_HIVENVVA	-----
B_HIVETR	-----
B_HIVHEI3	-----
B_HIVHEI4	-----
B_HIVHEI20	-----
B_HIVHEI22	-----
B_HIVHEI27	-----
B_HIVHEI28	-----
B_HIVUS1	-----
B_HIVUS2	-----
B_HIVUS3	-----
B_HIVUS4	-----
CONSENSUS-C	-----
93MW959.18	-----
93MW960.3	----Q----
HIVD757	-----
HIVD747	----E----
HIVD760	-----
HIVZAM20A	-----
HIVSM145A	----E----
HIVZAM18A	-----

CONSENSUS-B	ERYLKDDQQL
HIVDJ259A	-----
HIVDJ373A	-----
HIVSE364A	-----
HIVUG268A	----Q----
92BR025.9	-----
C_93MW965.26	----R----
CONSENSUS-D	-----
HIVJY1	-S-----
HIVNDK	----R----
HIVELI	-----
HIVZ2Z6	-----
HIVUG269A	-S--G----
HIVUG274A	-----
HIVSE365A	----R----
92UG024.2	-S-----
93ZR001.3	----Q----
CONSENSUS-E	-----KF
93TH966.8	-----KF
93TH975.15	-----KF
92TH022.2	-----KF
HIVTN243	-----K-
HIVTH0065	-----KF
E_92TH022.4	-----KF
E_93TH976.17	-----KF
E_HIVTN235	-----KF
E_HIVTN239	-----KF
E_HIVTN242	-----KF
CONSENSUS-F	----?---
HIVBZ163A	----Q----
HIVBZ126A	----Q----
93BR019.17	-----
93BR029.2	-----
CONSENSUS-G	----?---
HIVLBV217	----Q----
92RU131.9	-K-----
92UG975.10	----R----
HIVANT70	-TL-QN---
HIVMVP5180	-TLIQN--R
HIVVAU	-TFIQN---
SIVCPZGAB	----Q---I
SIVCPZANT	-K--R----
HIVZ3	----ES---

HIV CTL Epitopes

gp41 CTL epitope 2

HLA--B8

CONSENSUS-B **YLKDQQQLL**
Epitope2 -----

CONSENSUS-A **--R-----**
HIVSF1703 -----
HIVU455 --Q-----
HIVZ321 -----
92RW020.5 -----
HIVUG0314 --R-----
HIVD687 -----
HIVUG275A --R-----
HIVUG273A --R-----
HIVVII191A --R-----
HIVDJ264A --R-----
HIVDJ263A --R-----
HIVDJ258A --R-----
HIVKENYA --R-----
92UG031.7 --R-----
92UG037.8 --R-----
A_92UG037.8 --R-----

CONSENSUS-B -----
HIVJRCNF -----M
HIVJRFNL --G-----
HIVALA1 --R-----
HIVBRVA -----
HIVJH32 -----
HIVBAL1 --R-----
HIVYU2 --R-----
HIVMN -----
HIVHXB2R -----
HIVLAI -----
HIVNL43 -----
HIVMFA -----
HIVCAM1 -----
HIVNY5CG -----
HIVADA --R-----
HIVJFL --Q-----
HIVSIMI84 -----
HIVD31 --R-----
HIVSF162 -----
HIVBCSG3C -----
HIVOYI -----
HIVSF33 --R-----
HIVCDC42 -----
HIVSF2 --R-----
HIVSF2B13 --R-----
HIVHAN --R-----
HIVRF --R-----

CONSENSUS-B	YLKDQQQLL
HIVWMJ22	--R-----
HIVTB132	-----
92BR020.4	--G-----
HIVTH1412	-----
92US711.14	-----
91US712.4	-----
92US715.6	--R-----
92US716.6	-----
92HT593.1	-----
92HT594.10	-----
92HT596.4	-----
92HT599.24	-----
91HT651.11	-----
HIVRJS	-----
HIVGUN	F-R-----
HIVSC	--R-----
HIVSBA	--R-----
HIVSBB	-----
HIVSBC	--R-----
HIVP896	--R----M
91US006.10	--Q-----
91US005.11	--R-----
92US657.1	-----
92US714.1	--R-----
B_HIV1CM237X	-----
B_91HT652.11	-P-----
B_92UG005	-----
B_HIVMANC	--Q-----
B_HIV3202A12	-----
B_HIVWEAU160	-----
B_HIV168A	-----
B_HIVENVVA	-----
B_HIVETR	-----M
B_HIVHEI3	-----
B_HIVHEI4	-----
B_HIVHEI20	-----
B_HIVHEI22	-----
B_HIVHEI27	-----
B_HIVHEI28	-----
B_HIVUS1	-----
B_HIVUS2	-----
B_HIVUS3	-----
B_HIVUS4	-----
CONSENSUS-C	-----
93MW959.18	-----
93MW960.3	--Q-----
HIVD757	-----
HIVD747	--E-----
HIVD760	-----
HIVZAM20A	-----
HIVSM145A	--E-----
HIVZAM18A	-----

CONSENSUS-B	YLKDQQLL	CONSENSUS-B	YLKDQQLL
HIVDJ259A	-----	GX_HIVVI525A	F-----P-
HIVDJ373A	-----	AC_HIVZAM184	--Q-----
HIVSE364A	-----	AD_HIVK124A	-----
HIVUG268A	--Q----	AD_HIVUG266A	-----
92BR025.9	-----	AD_HIVMAL	--Q-R---
C_93MW965.26	--R----	BF_93BR020.10	-----
 CONSENSUS-D	 -----		
HIVJY1	-----		
HIVNDK	--R----		
HIVELI	-----		
HIVZZ6	-----		
HIVUG269A	--G----		
HIVUG274A	-----		
HIVSE365A	--R----		
92UG024.2	-----		
93ZR001.3	--Q----		
 CONSENSUS-E	 -----KF-		
93TH966.8	-----KF-		
93TH975.15	-----KF-		
92TH022.2	-----KF-		
HIVTH0065	-----KF-		
E_92TH022.4	-----KF-		
E_93TH976.17	-----KF-		
E_HIVTN235	-----KF-		
E_HIVTN239	-----KF-		
E_HIVTN242	-----KF-		
 CONSENSUS-F	 --?-----		
HIVBZ163A	--Q-----		
HIVBZ126A	--Q-----		
93BR019.17	-----		
93BR029.2	-----		
 CONSENSUS-G	 --?-----		
HIVLBV217	--Q-----		
92RU131.9	-----		
92UG975.10	--R-----		
 HIVANT70	L-QN----		
HIVMVP5180	LIQN--R-		
HIVVAU	FIQN----		
 SIVCPZGAB	--Q---I-		
SIVCPZANT	--R-----		
 HIVZ3	--ES----		

HIV CTL Epitopes

gp41 CTL epitope 3		CONSENSUS-B	TAVPWNASW
CONSENSUS-B	TAVPWNASW		
Epitope3	-----	HIVWMJ22	-T-----
CONSENSUS-A	-N----S--	HIVTB132	-T-----
HIVSF1703	-N----S--	92BR020.4	-T----T--
HIVU455	-T----S--	HIVTH1412	-----
HIVZ321	-N----S--	92US711.14	-T----T--
92RW020.5	-N----S--	91US712.4	-N----KT-
HIVUG0314	-N----S--	92US715.6	-T-----
HIVD687	-T----S--	92US716.6	-T----T--
HIVUG275A	-N----S--	92HT593.1	-T----T--
HIVUG273A	-T----S--	92HT594.10	-----T--
HIVVII191A	-N----Y--	92HT596.4	-----T--
HIVDJ264A	-T-----	92HT599.24	-----
HIVDJ263A	-N----S--	91HT651.11	-S----S--
HIVDJ258A	-T----S--	HIVRJS	-----T--
HIVKENYA	-N----S--	HIVGUN	-T----T--
92UG031.7	-N----S--	HIVSC	-T----T--
92UG037.8	-N----S--	HIVSBA	-----
A_92UG037.8	-N----S--	HIVSBB	-----
CONSENSUS-B	-----	HIVSBC	-----S--
HIVJRCSF	-----T--	HIVP896	-S----V--
HIVJRF	-----	91US006.10	-----
HIVALA1	-T-----	91US005.11	-T-----
HIVBRA	-----	92US657.1	-----V--
HIVJH32	-----	92US714.1	-----T--
HIVBAL1	-----	B_HIV1CM237X	-----N--
HIVYU2	-T----T--	B_91HT652.11	-S----S--
HIVMN	-T-----	B_92UG005	-N-R--S--
HIVHXB2R	-----	B_HIVMANC	-----S--
HIVLAI	-----	B_HIV3202A12	-----T--
HIVNL43	-----	B_HIVWEAU160	-T-----
HIVMFA	-----	B_HIV168A	-T-----
HIVCAM1	-----	B_HIVENVVA	-----
HIVNY5CG	-T-----	B_HIVETR	-----T--
HIVADA	-----	B_HIVHEI3	-----
HIVJFL	-T-----	B_HIVHEI4	-T----T--
HIVSIM184	-T-----	B_HIVHEI20	-----
HIVD31	-----	B_HIVHEI22	-N----T--
HIVSF162	-----	B_HIVHEI27	-T----T--
HIVBCSG3C	-----	B_HIVHEI28	-T-----
HIVOYI	-T-----	B_HIVUS1	-----D--
HIVSF33	-T----T--	B_HIVUS2	-----T--
HIVCDC42	-----	B_HIVUS3	-T----T--
HIVSF2	-----	B_HIVUS4	-T----S--
HIVSF2B13	-----T--	CONSENSUS-C	-----S--
HIVHAN	-T-----	93MW959.18	---A--S--
HIVRF	-T-----	93MW960.3	-T----S--
		HIVD757	-N----S--
		HIVD747	-T----S--
		HIVD760	-----S--
		HIVZAM20A	-----S--
		HIVSM145A	-----S--
		HIVZAM18A	---S--S--

CONSENSUS-B	TAVPWNASW	CONSENSUS-B	TAVPWNASW
HIVDJ259A	-N-----	GX_HIVVI525A	-N----T--
HIVDJ373A	-----S--	AC_HIVZAM184	-T----S--
HIVSE364A	-----S--	AD_HIVK124A	-N----S--
HIVUG268A	-----S--	AD_HIVUG266A	-S----S--
92BR025.9	-T----S--	AD_HIVMAL	-F----S--
C_93MW965.26	-----S--	BF_93BR020.10	-N----S--
 CONSENSUS-D	 -N----S--		
HIVJY1	-T----S--		
HIVNDK	-N----S--		
HIVELI	-N----S--		
HIVZZ6	-T----S--		
HIVUG269A	-N----S--		
HIVUG274A	-T----S--		
HIVSE365A	-N----S--		
92UG024.2	-R----S--		
93ZR001.3	-N----S--		
 CONSENSUS-E	 -----ST-		
93TH966.8	-----ST-		
93TH975.15	-----ST-		
92TH022.2	-----ST-		
HIVTN243	-----ST-		
HIVTH0065	-----ST-		
E_92TH022.4	-----ST-		
E_93TH976.17	-----ST-		
E_HIVTN239	-----S--		
E_HIVTN242	-----S--		
 CONSENSUS-F	 -N----S--		
HIVBZ163A	-N----S--		
HIVBZ126A	-N----S--		
93BR019.17	-N----S--		
93BR029.2	-D----S--		
 CONSENSUS-G	 -N----T--		
HIVLBV217	-N----T--		
92RU131.9	-N----T--		
92UG975.10	-N-----		
 HIVANT70	-S-K--RT-		
HIVMVP5180	-S-K--T--		
HIVVAU	-S-K--KT-		
 SIVCPZGAB	-T----N--		
SIVCPZANT	-T----N--		
 HIVZ3	-T----S--		

HIV CTL Epitopes

gp41 CTL epitope 4

HLA-A2

CONSENSUS-B **RLVDGFLAL**
Epitope4 **---N-S---**

CONSENSUS-A **---S-----**
HIVSF1703 **---S-----**
HIVU455 **---S----I**
HIVZ321 **---S---P-**
92RW020.5 **---S-----**
HIVUG0314 **---S-----**
HIVD687 **---S-----**
HIVUG275A **H---S-----**
HIVUG273A **---S-----**
HIVVII191A **---S-----**
HIVDJ264A **---S-----**
HIVDJ263A **---S-----**
HIVDJ258A **---S-----**
HIVKENYA **---T-----**
92UG031.7 **---S-----**
92UG037.8 **---S-----**
A_92UG037.8 **---S-----**

CONSENSUS-B **-----**
HIVJRCSF **Q--N-----**
HIVJRF1L **---N-----**
HIVALA1 **-----L--**
HIVBRVA **P-----**
HIVJH32 **Q---L--I**
HIVBAL1 **P--N-----**
HIVYU2 **P-----I**
HIVMN **---H---I**
HIVHXB2R **---N-S---**
HIVLAI **---N-S---**
HIVNL43 **---N-S---**
HIVMFA **---N-S---**
HIVCAM1 **---T-----**
HIVNY5CG **P--N-----**
HIVADA **-----**
HIVJFL **Y--T-----**
HIVSIMI84 **Q--T---PI**
HIVD31 **---K-----**
HIVSF162 **P--H-L---**
HIVBCSG3C **---N-----**
HIVOYI **-----**
HIVSF33 **---N-----**
HIVCDC42 **---H-----**
HIVSF2 **-----**
HIVSF2B13 **-----**
HIVHAN **---S-----**
HIVRF **GA-N---T-**
HIVWMJ22 **---H-----**

CONSENSUS-B	RLVDGFLAL
HIVTB132	-----I
92BR020.4	---T-L-EI
HIVTH1412	---S-L-T-
92US711.14	---N---T-
91US712.4	Q-----I
92US715.6	Q--T---I
92US716.6	Q-----TI
92HT593.1	---N-----
92HT594.10	-I-N-----
92HT596.4	-I-N-----
92HT599.24	---N-----
91HT651.11	P-AH-----
HIVRJS	P--T-----
HIVGUN	---H-----
HIVSC	-----I
HIVP896	P--N-----
91US006.10	P-----
91US005.11	---T---E-
92US657.1	Q-----I
92US714.1	---N-----
B_HIV1CM237X	--MN---T-
B_91HT652.11	P-AH-----
B_92UG005	---N--S--
B_HIVMANC	---H-----
B_HIV3202A12	-----
B_HIVWEAU160	-----T-
B_HIV168A	-----
B_HIVENVVA	---N-----
B_HIVETR	P----L---
B_HIVHEI3	-----
B_HIVHEI4	T-----I
B_HIVHEI20	Q--N-----
B_HIVHEI22	Q-----
B_HIVHEI27	P-----
B_HIVHEI28	---N-----
B_HIVUS1	-----L--
B_HIVUS2	-----
B_HIVUS3	P--H-----
B_HIVUS4	---H-L-V-
CONSENSUS-C	---S-----
93MW959.18	---S-----
93MW960.3	---N-----
HIVD757	---N-----
HIVZAM20A	---N-----
HIVSM145A	---N-----
HIVZAM18A	-----
HIVDJ259A	---S-----
HIVDJ373A	---S-----
HIVSE364A	---S---SI
HIVUG268A	--IS-----
92BR025.9	---S-----
C_93MW965.26	---S---P-

CONSENSUS-B	RLVDGFLAL
CONSENSUS-D	---N---S--
HIVJY1	---N---S--
HIVNDK	---N-LF--
HIVELI	--LN--S--
HIVZ2Z6	---N---S--
HIVUG269A	---S---S--
HIVUG274A	---N---S--
HIVSE365A	---N---S--
92UG024.2	--LN-LS--
93ZR001.3	--LN--S--
 CONSENSUS-E	 ----S-----
93TH966.8	---T-----
93TH975.15	---S-----
92TH022.2	---S-----
HIVTN243	---S-----
HIVTH0065	---S-----
E_92TH022.4	---S-----
E_93TH976.17	---S-----
E_HIVTN235	---S-----
E_HIVTN239	---S-----
E_HIVTN242	---S-----
 CONSENSUS-F	 ----N-----
HIVBZ163A	-----
HIVBZ126A	---N-----
93BR019.17	---N-----
93BR029.2	---N-----
 CONSENSUS-G	 ----S-----
HIVLBV217	---S---SI
92RU131.9	--AS-----
92UG975.10	---N-----
 HIVANT70	PSPQ---P-
HIVMVP5180	A-PP---QQ
HIVVAU	P-PQ---H-
 SIVCPZGAB	---E-C-P-
SIVCPZANT	A-QH---F--
 HIVZ3	---N-----
 GX_HIVVI525A	-SAN---P-
AC_HIVZAM184	---S-----
AD_HIVK124A	---N---S--
AD_HIVUG266A	---S-----
AD_HIVMAL	---N---S--
BF_93BR020.10	---N-----

HIV CTL Epitopes

gp41 CTL epitope 5

HLA-?

CONSENSUS-B **HRLRDLLLLI**
Epitope5 **-----**

CONSENSUS-A **-----FI--**
HIVSF1703 **-----FI--**
HIVU455 **-----FA--**
HIVZ321 **-----CA--**
92RW020.5 **-----FIS-**
HIVUG0314 **-----FI--**
HIVUG275A **-----FI--**
HIVUG273A **-----FI--**
HIVVI191A **-----FI--**
HIVDJ264A **-H---FV--**
HIVDJ263A **-----FV--**
HIVDJ258A **-Q---FV--**
HIVKENYA **-----FI--**
92UG031.7 **-----FI--**
92UG037.8 **-Q---FI--**
A_92UG037.8 **-Q---FI--**

CONSENSUS-B **-----**
HIVJRCSF **-----T**
HIVJRFL **-----T**
HIVALA1 **-----**
HIVBRVA **-----**
HIVJH32 **-----**
HIVBAL1 **-----**
HIVYU2 **-----**
HIVMN **-H.-----**
HIVHXB2R **-----**
HIVLAI **-----**
HIVNL43 **-----**
HIVMFA **-----**
HIVCAM1 **-----**
HIVNY5CG **-----**
HIVADA **-----**
HIVJFL **-----**
HIVSIMI84 **-----**
HIVD31 **-----**
HIVSF162 **-----I--**
HIVBCSG3C **-----I-V**
HIVOYI **-----I--**
HIVSF33 **--T-----**
HIVCDC42 **-----**
HIVSF2 **R-----**
HIVSF2B13 **R-----**
HIVHAN **R-----**
HIVRF **-----**
HIVWMJ22 **-----**
HIVTB132 **-----V**

CONSENSUS-B	HRLRDLLLLI
92BR020.4	R-----
HIVTH1412	-----
92US711.14	-----
91US712.4	Y-----
92US715.6	-----
92US716.6	-----
92HT593.1	-----
92HT594.10	-----
92HT596.4	-----
92HT599.24	-----
91HT651.11	-----
HIVRJS	-----
HIVGUN	-----
HIVP896	-L--N---
91US006.10	-----
91US005.11	-----
92US657.1	-----
92US714.1	-----
B_HIV1CM237X	-----
B_91HT652.11	-----
B_92UG005	-----I--
B_HIVMANC	-----S-
B_HIV3202A12	-----
B_HIVWEAU160	---I----
B_HIV168A	-----
B_HIVENVVA	-----
B_HIVETR	-----
B_HIVHEI3	-----
B_HIVHEI4	R-----
B_HIVHEI20	-----
B_HIVHEI22	-----
B_HIVHEI27	-----
B_HIVHEI28	-----
B_HIVUS1	-----
B_HIVUS2	-----
B_HIVUS3	-----
B_HIVUS4	-----
CONSENSUS-C	-----FI--
93MW959.18	-----FI-V
93MW960.3	-Q-----V
HIVZAM20A	-Q---FT--
HIVSM145A	-----FI-V
HIVZAM18A	-----FI--
HIVDJ259A	R-----I--
HIVDJ373A	-----I--
HIVSE364A	-----FI--
HIVUG268A	R-----
92BR025.9	-----I--
C_93MW965.26	-Q---FI--

CONSENSUS-B	HRLRDLLLLI
CONSENSUS-D	-----I--
HIVJY1	-----I--
HIVNDK	-----SI--
HIVELI	-----I--
HIVZ2Z6	-----I--
HIVUG269A	-----I--
HIVUG274A	R-----
HIVSE365A	-----I--
92UG024.2	-H----I--
93ZR001.3	-----I--
 CONSENSUS-E	 -----FI--
93TH966.8	-----FIS-
93TH975.15	-----FI--
92TH022.2	-----FI--
HIVTN243	-----FIS-
HIVTH0065	R----FI--
E_92TH022.4	-----FI--
E_93TH976.17	-----
E_HIVTN235	-----FI--
E_HIVTN239	-----FI--
E_HIVTN242	-----FI--
 CONSENSUS-F	 RH---?I--
HIVBZ163A	-H-----
HIVBZ126A	RH---I--
93BR019.17	RH---FI--
93BR029.2	RH---FI--
 CONSENSUS-G	 -----FI--
HIVLBV217	-Q---FI--
92RU131.9	-----FI--
92UG975.10	-----SI--
 HIVANT70	-L-SN-ASG
HIVMVP5180	-L-SN-ISG
HIVVAU	-L-SN-ASE
 SIVCPZGAB	QS-TS-ACN
 HIVZ3	-----I--
 GX_HIVVI525A	RL-----
AC_HIVZAM184	----CI--
AD_HIVK124A	-----I--
AD_HIVUG266A	-----
AD_HIVMAL	-----
BF_93BR020.10	-----S

HIV CTL Epitopes

gp41 CTL epitope 6

HLA-A31, HLA-A3.1

CONSENSUS-B RLRDLLLLIVAR
Epitope6 -----T-

CONSENSUS-A ----FI--A--
 HIVSF1703 ----FI--A--
 HIVU455 ----FA-----
 HIVZ321 ----CA--A--
 92RW020.5 ----FIS-A--
 HIVUG0314 ----FI--A--
 HIVUG275A ----FI--A--
 HIVUG273A ----FI-----
 HIVVI191A ----FI-----
 HIVDJ264A H---FV--AV-
 HIVDJ263A ----FV--AV-
 HIVDJ258A Q---FV--AV-
 HIVKENYA ----FI--ATE
 92UG031.7 ----FI--A--
 92UG037.8 Q---FI-----
 A_92UG037.8 Q---FI-----

CONSENSUS-B -----
 HIVJRCSF -----T-T-
 HIVJRFL -----T-T-
 HIVALA1 -----T-
 HIVBRVA -----T-
 HIVJH32 -----T-
 HIVBAL1 -----M-
 HIVYU2 -----T-
 HIVMN H.-----A--
 HIVHXB2R -----T-
 HIVLAI -----T-
 HIVNL43 -----T-
 HIVMFA -----T-
 HIVCAM1 -----
 HIVNY5CG -----
 HIVADA -----
 HIVJFL -----T-
 HIVSIMI84 -----
 HIVD31 -----A--
 HIVSF162 ----I--A--
 HIVBCSG3C -----I-V-T-
 HIVOYI -----I----
 HIVSF33 --T-----
 HIVCDC42 -----
 HIVSF2 -----A--
 HIVSF2B13 -----AV-
 HIVHAN -----K-
 HIVRF -----V-
 HIVWMJ22 -----K-
 HIVTB132 -----V-T-

CONSENSUS-B	RLRDLLLLIVAR
92BR020.4	-----
HIVTH1412	-----
92US711.14	-----
91US712.4	-----T-
92US715.6	-----
92US716.6	-----T-
92HT593.1	-----I--
92HT594.10	-----
92HT596.4	-----A--
92HT599.24	-----
91HT651.11	-----I--
HIVRJS	-----
HIVGUN	-----
HIVP896	L--N-----T-
91US006.10	-----T-
91US005.11	-----
92US657.1	-----LT-
92US714.1	-----
B_HIV1CM237X	-----
B_91HT652.11	-----A--
B_92UG005	-----I--A--
B_HIVMANC	-----S-A--
B_HIV3202A12	-----T-
B_HIVWEAU160	--I-----AK-
B_HIV168A	-----T-
B_HIVENVVA	-----T-
B_HIVETR	-----T-
B_HIVHEI3	-----AT-
B_HIVHEI4	-----
B_HIVHEI20	-----
B_HIVHEI22	-----
B_HIVHEI27	-----T-
B_HIVHEI28	-----T-
B_HIVUS1	-----LT-
B_HIVUS2	-----T-
B_HIVUS3	-----
B_HIVUS4	-----CK-
CONSENSUS-C	----FI--A--
93MW959.18	----FI-VA--
93MW960.3	Q-----VA--
HIVZAM20A	Q---FT--A--
HIVSM145A	----FI-VA--
HIVZAM18A	----FI--A--
HIVDJ259A	----I--A--
HIVDJ373A	----I-----
HIVSE364A	----FI-----
HIVUG268A	-----A--
92BR025.9	-----I--A--
C_93MW965.26	Q---FI-----

CONSENSUS-B	RLRDLLLIVAR
CONSENSUS-D	-----I--A--
HIVJY1	-----I--AT-
HIVNDK	----SI--A--
HIVELI	-----I--AV-
HIVZ2Z6	-----I--A--
HIVUG269A	-----I--AT-
HIVUG274A	-----A--
HIVSE365A	-----I--A--
92UG024.2	H----I--A--
93ZR001.3	-----I--AT-
 CONSENSUS-E	 -----FI--A--
93TH966.8	-----FIS-A--
93TH975.15	-----FI--A--
92TH022.2	-----FI--A--
HIVTN243	-----FIS-A--
HIVTH0065	-----FI--A--
E_92TH022.4	-----FI--A--
E_93TH976.17	-----AT-
E_HIVTN235	-----FI--A--
E_HIVTN239	-----FI--A--
E_HIVTN242	-----FI--A--
 CONSENSUS-F	 H---?I--A--
HIVBZ163A	H-----T--
HIVBZ126A	H---I--A--
93BR019.17	H---FI--A--
93BR029.2	H---FI--A--
 CONSENSUS-G	 -----FI--A--
HIVLBV217	Q---FI---T-
92RU131.9	----FI--A--
92UG975.10	----SI--A--
 HIVANT70	L-SN-ASGI
HIVMVP5180	L-SN-ISGI
HIVVAU	L-SN-ASEI
 SIVCPZGAB	S-TS-ACN-W-
 GX_HIVVI525A	L-----.--
AC_HIVZAM184	----CI--A.--
AD_HIVK124A	-----I--A.T-
AD_HIVUG266A	-----A.T-
AD_HIVMAL	-----A.T-
BF_93BR020.10	-----SI.T-

HIV CTL Epitopes

gp41 CTL epitope 7

HLA-B27

CONSENSUS-B **GRRGWEALKY**
Epitope7 -----

CONSENSUS-A **L-L---G---**
HIVSF1703 L-L---G---
HIVU455 L-L---G---
HIVZ321 I-----T---
92RW020.5 L-L---G---
HIVUG0314 L-L---G---
HIVUG275A VELLGQG---
HIVUG273A -H----GI--
HIVVI191A -----
HIVDJ264A L-L--G----
HIVDJ263A L-L----Q-
HIVDJ258A L-L----Q-
HIVKENYA L-L---G---
92UG031.7 L-L---G---
92UG037.8 L-L---G---
A_92UG037.8 L-L---G---

CONSENSUS-B -----

HIVJRCSF -----I---
HIVJRFL -----V---
HIVALA1 -----V---
HIVBRA -----V---
HIVJH32 -----
HIVBAL1 LAG---V---
HIVYU2 -----GV---
HIVMN -----V---
HIVHB2R -----

HIVLAI -----

HIVNL43 -----

HIVMFA -----

HIVCAM1 -----

HIVNY5CG -----

HIVADA -----V---

HIVJFL -----

HIVSIMI84 -----I---

HIVD31 -----V---

HIVSF162 -----

HIVBCSG3C -----

HIVOYI -----V---

HIVSF33 -----V---

HIVCDC42 -----V---

HIVSF2 -H-----

HIVSF2B13 -H----V---

HIVHAN -----V---

HIVRF -----

HIVWMJ22 -----

92BR020.4 -----

HIVTH1412 -----R-

92US711.14 -----L--

91US712.4 -----

CONSENSUS-B **GRRGWEALKY**

92US715.6 -----I---
92US716.6 -----V---
92HT593.1 -----
92HT594.10 -----
92HT596.4 -----
92HT599.24 I-----
91HT651.11 -----

HIVRJS -----
HIVGUN -----V---
HIVP896 -----
91US006.10 -H---GV---
91US005.11 -L---V---
92US657.1 -----I---
92US714.1 -----I-R-
B_HIV1CM237X -----R-
B_91HT652.11 -----
B_92UG005 -----I--
B_HIVMANC -----I---
B_HIV3202A12 -----V---
B_HIVWEAU160 -----
B_HIV168A -----I---
B_HIVENVVA -----V---
B_HIVETR --K---V---
B_HIVHEI3 -----
B_HIVHEI4 -----I---
B_HIVHEI20 -----
B_HIVHEI22 -----
B_HIVHEI27 -----I---
B_HIVHEI28 -----V---
B_HIVUS1 -----
B_HIVUS2 -----
B_HIVUS3 -----
B_HIVUS4 -----P---

CONSENSUS-C **LQ-----**

93MW959.18 LQK--D---
93MW960.3 LQ-----
HIVZAM20A LQ-----
HIVSM145A LQ-----
HIVZAM18A LQ-----
HIVDJ259A -Q----T---
HIVDJ373A -Q----T---
HIVSE364A IQ----I---
HIVUG268A LQ-----
92BR025.9 IQ----I---
C_93MW965.26 LQ-----

CONSENSUS-D -----

HIVJY1 -----I--
HIVNDK -----
HIVELI -----DI---
HIVZ2Z6 -----
HIVUG269A -----I--
HIVUG274A -----K-I--
HIVSE365A -----V---
92UG024.2 -----I--

CONSENSUS-B	GRRGWEALKY
CONSENSUS-E	L-----G---
93TH966.8	L-----G---
93TH975.15	L-----G---
92TH022.2	L-----G---
HIVTN243	L-----G---
E_92TH022.4	L-----G---
E_93TH976.17	L-----G---
E_HIVTN235	L-----G---
E_HIVTN239	L-----G---
E_HIVTN242	L-----G---
 CONSENSUS-F	L-----L
HIVBZ163A	L-----L
HIVBZ126A	L-----L
93BR019.17	L-----
93BR029.2	LK-----L
 CONSENSUS-G	L-L---G---
HIVLBV217	L-L---G---
92RU131.9	L-L---G---
92UG975.10	L-L---S---
 HIVANT70	RLGL-ILGQK
HIVMVP5180	-LGL-ILGQK
HIVVAU	-LGL-IIGQR
 SIVCPZGAB	L-LLR-R-CL

HIV CTL Epitopes

gp41 CTL epitope 8

HLA-A2

CONSENSUS-B **SLLNATAIAV**
Epitope8 **-----D---**

CONSENSUS-A **N--DTI----**
 HIVSF1703 N--DTI----
 HIVU455 T--D-V-V--
 HIVZ321 N--DTV----
 92RW020.5 N-VDTI----
 HIVUG0314 N-FDTI----
 HIVUG275A --FDTI-VVI
 HIVUG273A N--DTI----
 HIVVI191A T--D-----
 HIVDJ264A N--DTI----
 HIVDJ263A N--DTI-L--
 HIVDJ258A N--DTI--V--
 HIVKENYA N-VDTI--V--
 92UG031.7 N-FDTI----
 92UG037.8 N-FDTI--V--
 A_92UG037.8 N-FDTI--V--

CONSENSUS-B **-----**
 HIVJRCNF -----
 HIVJRFL -----
 HIVALA1 -----
 HIVBRVA -----
 HIVJH32 --F--I----
 HIVBAL1 -----V--
 HIVYU2 -----
 HIVMN -----
 HIVHXB2R -----
 HIVLAI -----
 HIVNL43 N-----
 HIVMFA -----
 HIVCAM1 --FDTI----
 HIVNY5CG -----V--
 HIVADA -----
 HIVJFL -----
 HIVSIMI84 ----T---V--
 HIVD31 -----
 HIVSF162 --FD-I----
 HIVBCSG3C N---V----
 HIVOYI -----
 HIVSF33 -----
 HIVCDC42 --V-V----
 HIVSF2 -W-----
 HIVSF2B13 -----
 HIVHAN --F-TI----
 HIVRF -----T-----
 HIVWMJ22 G----I----
 HIVTB132 -----

CONSENSUS-B	SLLNATAIAV
92BR020.4	-----V--
HIVTH1412	-----
92US711.14	-----
91US712.4	-----
92US715.6	-----
92US716.6	-----V-
92HT593.1	N--D-----
92HT594.10	---S-----
92HT596.4	-----
92HT599.24	-----
91HT651.11	-----
HIVP896	-----
91US006.10	-----I----
91US005.11	---D-V----
92US657.1	-----
92US714.1	-----
B_HIV1CM237X	----T-----
B_91HT652.11	----T-----
B_92UG005	--F-T-----
B_HIVMANC	---V-----
B_HIV3202A12	-----
B_HIVWEAU160	-----
B_HIV168A	-----V--
B_HIVENVVA	-----
B_HIVETR	-----
B_HIVHEI3	-----
B_HIVHEI4	-----
B_HIVHEI20	-----
B_HIVHEI22	-----
B_HIVHEI27	-----
B_HIVHEI28	-----
B_HIVUS1	N-----
B_HIVUS2	N---T----
B_HIVUS3	-----
B_HIVUS4	--F-----
CONSENSUS-C	---DTI----
93MW959.18	-IVDTL----
93MW960.3	--VDTI----
HIVZAM20A	---DTI----
HIVSM145A	---DTI--T-
HIVZAM18A	--VD-I--T-
HIVDJ259A	----T---T-
HIVDJ373A	---DT-----
HIVSE364A	---DTI--T-
HIVUG268A	---DTI----
92BR025.9	--FDTI----
C_93MW965.26	---DTI--T-

CONSENSUS-B	SLLNATAIAV
CONSENSUS-D	--FDTI----
HIVJY1	-----
HIVNDK	---DTI----
HIVELI	--FD-I----
HIVZ2Z6	---DTI----
HIVUG269A	--FDTI--V-
HIVUG274A	--FDT-----
HIVSE365A	---DTI----
92UG024.2	--F-T---V-
93ZR001.3	--F-----
 CONSENSUS-E	 -----
93TH966.8	-----
93TH975.15	-----
92TH022.2	--F-----
HIVTN243	-----
E_92TH022.4	--F-----
E_93TH976.17	-----
E_HIVTN235	---D----I-
E_HIVTN239	----T-----
E_HIVTN242	--FD-----
 CONSENSUS-F	 ----T---V-
HIVBZ163A	G-F-T---V-
HIVBZ126A	----T---V-
93BR019.17	-----
93BR029.2	----T---V-
 CONSENSUS-G	 N-?DTI----
HIVLBV217	N--DTV---T
92RU131.9	--FDTI--T-
92UG975.10	N-VDTI-V--
 HIVANT70	---DTL-V--
HIVMVP5180	N--DTI-VS-
HIVVAU	N--DTV-V--
 SIVCPZGAB	---D-----
 HIVZ3	-----V-
 GX_HIVVI525A	H---T-----
AC_HIVZAM184	---DTI----
AD_HIVK124A	--VDTI-VV-
AD_HIVUG266A	N-F-T-----
AD_HIVMAL	----T-----
BF_93BR020.10	--F--I-----

HIV CTL Epitopes

gp41 CTL epitope 9

HLA-A2, murine H-2 d, p, u, g

CONSENSUS-B **DRVIEVVQRAYRAIL**
Epitope9 **-----G----R**

CONSENSUS-A **-----IG--IG----**
HIVSF1703 **-----IG-AIC---**
HIVU455 **-----IG-TIG----**
HIVZ321 **-----G--F-**
92RW020.5 **-----G--IF----**
HIVUG0314 **-----IG--IG---I**
HIVUG275A **-----LG--LC----**
HIVUG273A **-----IG--IG--F-**
HIVVI191A **--I--IG--IV----**
HIVDJ264A **-----IG--VG---R**
HIVDJ263A **-----IG--VG----**
HIVDJ258A **-----IG-EVG----**
HIVKENYA **-----IA-GIG----**
92UG031.7 **-----IG--IG---I**
92UG037.8 **-----G--LG----**
A_92UG037.8 **-----G--LG----**

CONSENSUS-B **-----**
HIVJRCSF **--I-----V-----**
HIVJRFL **--I--AL--T-----**
HIVALA1 **-----L--F-----**
HIVBRVA **--A-----F-----**
HIVJH32 **--LKIL--F-----**
HIVBAL1 **-----L--V-----**
HIVYU2 **-----IL--F--V-**
HIVMN **-----L--G-----**
HIVHXB2R **-----G-C---R**
HIVLAI **-----G-C---R**
HIVNL43 **-----L-A-----R**
HIVMFA **-----G-----R**
HIVCAM1 **-----C-----**
HIVNY5CG **-----A--IC-G--**
HIVADA **-----I-----**
HIVJFL **--I-----IG-----**
HIVSIMI84 **-----IG--V-**
HIVD31 **-----W-----**
HIVSF162 **--I---A--IG--F-**
HIVBCSG3C **-----T-----**
HIVOYI **-----I-----F-**
HIVSF33 **-----VG-----**
HIVCDC42 **-----I---F-**
HIVSF2 **-----A-----**
HIVSF2B13 **-----**
HIVHAN **-----C-----**
HIVRF **--I---A--IL--F-**
HIVWMJ22 **-----IC---I**
HIVTB132 **-----L--V-----**

CONSENSUS-B	DRVIEVVQRAYRAIL
92BR020.4	--I--IA--FF-GF-
HIVTH1412	-----
92US711.14	-----I
91US712.4	-----L--IG----
92US715.6	-----L--G----
92US716.6	-----L--W----
92HT593.1	--I---R--F----
92HT594.10	-----II--IG----
92HT596.4	-----II--IG----
92HT599.24	--I--G-RGVC----
91HT651.11	--I--I---V--L-
HIVP896	----KI----C---R
91US006.10	--I---L---C----
92US657.1	--I-----VV----
92US714.1	--I-----G--V-
B_HIV1CM237X	-----
B_91HT652.11	--I--I---IV----
B_92UG005	--I--I---IG----
B_HIVMANC	--I-----VG----
B_HIV3202A12	-----IC----
B_HIVWEAU160	-----I---TC----
B_HIV168A	--V--L--G--V-
B_HIVENVVA	-----IC---R
B_HIVETR	-----IL--T-----
B_HIVHEI3	-----A--TC----
B_HIVHEI4	-----II-----
B_HIVHEI20	-----I---C----
B_HIVHEI22	-----L--V---I
B_HIVHEI27	-----F-----
B_HIVHEI28	-----LL--F-----
B_HIVUS1	-----L-----
B_HIVUS2	-----L--I---FC
B_HIVUS3	-----IG-----
B_HIVUS4	--I--I---IF--VI
CONSENSUS-C	--I--LI--IC---?
93MW959.18	--IL-SL--IG---R
93MW960.3	--I--LI--LG---Y
HIVZAM20A	--I--L---IC---R
HIVSM145A	--I--LA--IC-GVR
HIVZAM18A	--I--FI--IC---R
HIVDJ259A	--I-KFI-GLW---C
HIVDJ373A	--I--II--IW--FC
HIVSE364A	--I--L---IC---S
HIVUG268A	--I---G-GIG----
92BR025.9	--I---I-GIW---C
C_93MW965.26	--L-----IR---C

CONSENSUS-B	DRVIEVVQRAYRAIL
CONSENSUS-D	--I---?---C--V-
HIVJY1	--I--LIR--F--V-
HIVNDK	-----C----
HIVELI	----II---C--V-
HIVZ2Z6	----I-R--C--V-
HIVUG269A	----I---V--V-
HIVUG274A	--I--I---V--V-
HIVSE365A	--I-D----C----
92UG024.2	--I--LI--IG----
93ZR001.3	--I---G-TIF----
 CONSENSUS-E	 -----A-G-W----
93TH966.8	-----A-GIW----
93TH975.15	-----A-G-W----
92TH022.2	--I--A---W----
HIVTN243	-K----A-G-W----
E_92TH022.4	--I--A---W----
E_93TH976.17	--I--A---W----
E_HIVTN235	-----A-G-W----
E_HIVTN239	-----A-G-W----
E_HIVTN242	-----A-G-W----
 CONSENSUS-F	 --?-?AL--?G----
HIVBZ163A	--I-AAL--IG----
HIVBZ126A	--I-AAL--IG----
93BR019.17	----AL---G----
93BR029.2	----AL---G--V-
 CONSENSUS-G	 -----C----
HIVLBV217	-----A---C----
92RU131.9	-----TC----
92UG975.10	-W---I---C----
 HIVANT70	-GI-AGI--IGTG-R
HIVMVP5180	-GI-LGL--IGQGF-
HIVVAU	-ST-LGI-SIG-G--
 SIVCPZGAB	--I--AF-VTL-I-R
 HIVZ3	--I---G--IC----
 GX_HIVVI525A	----I--I-C--V-
AC_HIVZAM184	--I--IG---C---R
AD_HIVK124A	-SI-KIG--LG--F-
AD_HIVUG266A	--A--I---V----
AD_HIVMAL	----IG--FG----
BF_93BR020.10	----AI--IC--V-

HIV CTL Epitopes

gp41 CTL epitope 10		CONSENSUS-B	IPRRIRQGL
CONSENSUS-B	IPRRIRQGL		
Epitope10	-----	HIVTB132	--T-----
CONSENSUS-A	-----	92BR020.4	-----
HIVSF1703	-----F	HIVTH1412	--T-----
HIVU455	-----	92US711.14	--T-----
HIVZ321	-----	91US712.4	--T-----
92RW020.5	-----	92US715.6	-----F
HIVUG0314	-----F	92US716.6	--T-----
HIVUG275A	-----F	92HT593.1	--T-----
HIVUG273A	-----F	92HT594.10	V-T-----
HIVVI191A	-----A	92HT596.4	V-T-----
HIVDJ264A	--V-----	92HT599.24	-----
HIVDJ263A	-----	91HT651.11	--T-----
HIVDJ258A	-----	HIVP896	--T-----
HIVKENYA	-----F	91US006.10	--T-----
92UG031.7	-----F	92US657.1	--T-----
92UG037.8	-----	92US714.1	----V----
A_92UG037.8	-----	B_HIV1CM237X	--T-----
CONSENSUS-B	-----	B_91HT652.11	--T-----
HIVJRCSF	--T-----	B_92UG005	--T-----A
HIVJRFL	--T-----	B_HIVMANC	--V-----
HIVALA1	-----F	B_HIVENVVA	----V----
HIVBRVA	-----	B_HIVETR	--VK-----
HIVJH32	--T-----	B_HIVHEI3	-----
HIVBAL1	-----	B_HIVHEI4	--I-----
HIVYU2	--V-----	B_HIVHEI20	-----
HIVMN	--T-----	B_HIVHEI22	--T-----
HIVHXB2R	-----	B_HIVHEI27	--T-----
HIVLAI	-----	B_HIVHEI28	----T----
HIVNL43	-----	B_HIVUS1	--T-----
HIVMFA	-----	B_HIVUS2	-----
HIVCAM1	-----	B_HIVUS3	--T-----
HIVNY5CG	-----	B_HIVUS4	-----
HIVADA	--T-----	CONSENSUS-C	-----F
HIVJFL	--V-----	93MW959.18	--A-----F
HIVSIM184	-----F	93MW960.3	-----F
HIVD31	--V-----	HIVSM145A	--T-----F
HIVSF162	-----F	HIVDJ259A	-----F
HIVBCSG3C	-----	HIVDJ373A	-----F
HIVOYI	-----	HIVSE364A	-----F
HIVSF33	--T-----F	HIVUG268A	-----F
HIVCDC42	-----F	92BR025.9	-----F
HIVSF2	-H-----	C_93MW965.26	-----F
HIVSF2B13	-----		
HIVHAN	---V---		
HIVRF	-----		
HIVWMJ22	-----		

CONSENSUS-B	IPRRIRQGL
CONSENSUS-D	-----
HIVJY1	----V----
HIVNDK	V-----
HIVELI	-----
HIVZ2Z6	--T-----
HIVUG269A	-----F
HIVUG274A	--T-----
HIVSE365A	--T-----
92UG024.2	--A-----
93ZR001.3	-----
 CONSENSUS-E	-----
93TH966.8	-----
93TH975.15	-----
92TH022.2	-----
E_92TH022.4	-----
E_93TH976.17	-----
 CONSENSUS-F	--?-----?
HIVBZ163A	--T-----F
HIVBZ126A	--T-----F
93BR019.17	-----
93BR029.2	-----
 CONSENSUS-G	-----
HIVLBV217	-----
92RU131.9	-----
92UG975.10	-----
 HIVANT70	-----
HIVMVP5180	-----A
HIVVAU	-----
 SIVCPZGAB	-----
 HIVZ3	-----F
 GX_HIVVI525A	-----F
AC_HIVZAM184	--T-----F
AD_HIVK124A	-----F
AD_HIVUG266A	--T-----F
AD_HIVMAL	-----F
BF_93BR020.10	V-T-----

HIV CTL Epitopes

gp41 CTL epitope 11

HLA-B8, HLA-A30

CONSENSUS-B RRIRQGLERALL
Epitope11 -----I--

CONSENSUS-A -----
HIVU455 -----
HIVZ321 -----
92RW020.5 -----G--
HIVUG0314 -----F----
HIVUG275A -----F----
HIVUG273A -----F----
HIVVI191A -----A-K--Q
HIVDJ264A V-----
HIVDJ263A -----
HIVDJ258A -----
HIVKENYA -----F----
92UG031.7 -----F----
92UG037.8 -----
A_92UG037.8 -----

CONSENSUS-B -----
HIVJRCSF T-----
HIVJRLF T-----
HIVALA1 -----F----
HIVBRVA -----Q
HIVJH32 T-----
HIVBAL1 -----
HIVYU2 V-----
HIVMN T-----

HIVHXB2R -----I--
HIVLAI -----I--
HIVNL43 -----I--
HIVMFA -----I--
HIVCAM1 -----L--
HIVNY5CG -----L--
HIVADA T-----L--
HIVJFL V-----
HIVSIMI84 -----F----
HIVD31 V-----
HIVSF162 -----F----
HIVBCSG3C -----L--
HIVOYI -----
HIVSF33 T-----F----
HIVCDC42 -----F----
HIVSF2 -----L--
HIVSF2B13 -----L--
HIVHAN --V-----
HIVRF -----
HIVWMJ22 -----
92BR020.4 -----Q
HIVTH1412 T-----

CONSENSUS-B RRIRQGLERALL

92US711.14 T-----
91US712.4 T-----
92US715.6 -----F----
92US716.6 T-----
92HT593.1 T-----
92HT594.10 T-----
92HT596.4 T-----
92HT599.24 -----
91HT651.11 T-----
HIVP896 T-----
91US006.10 T-----
92US657.1 T-----
92US714.1 --V-----
B_91HT652.11 T-----
B_92UG005 T----A----
B_HIVMANC V-----
B_HIV3202A12 T-----
B_HIVWEAU160 -----
B_HIV168A -----
B_HIVENVVA --V-----
B_HIVETR VK-----
B_HIVHEI3 -----S--
B_HIVHEI4 I-----
B_HIVHEI20 -----F-V
B_HIVHEI22 T-----
B_HIVHEI27 T-----
B_HIVHEI28 --T-----
B_HIVUS1 T-----
B_HIVUS2 -----L--
B_HIVUS3 T-----L--
B_HIVUS4 -----

CONSENSUS-C -----F-A--Q
93MW959.18 A-----F-A---
93MW960.3 -----F-A---
HIVSM145A T-----F-A---
HIVDJ259A -----F-A--Q
HIVDJ373A -----F-A--Q
HIVSE364A -----F-A--Q
HIVUG268A -----F-A--Q
92BR025.9 -----F-A--Q
C_93MW965.26 -----F-T---

CONSENSUS-D

HIVJY1 --V-----
HIVNDK -----L--
HIVELI -----S--
HIVZ2Z6 T-----L--
HIVUG269A -----F----
HIVUG274A T-----
HIVSE365A T-----
92UG024.2 A-----L--
93ZR001.3 -----

CONSENSUS-B	RRIRQGLERALL
CONSENSUS-E	-----
93TH966.8	-----
93TH975.15	-----
92TH022.2	-----
E_92TH022.4	-----
E_93TH976.17	-----S--
CONSENSUS-F	?-----?-----
HIVBZ163A	T-----F-----
HIVBZ126A	T-----F-----
93BR019.17	-----
93BR029.2	-----
CONSENSUS-G	-----
HIVLBV217	-----
92RU131.9	-----
92UG975.10	-----
HIVANT70	-----S--
HIVMVP5180	-----A---I-V
HIVVAU	-----L--
SIVCPZGAB	-----
HIVZ3	-----F-----
GX_HIVVI525A	-----F-----
AC_HIVZAM184	T-----F-----
AD_HIVK124A	-----F-----
AD_HIVUG266A	T-----F-----
AD_HIVMAL	-----F-----
BF_93BR020.10	T-----

HIV CTL Epitopes

**I-140
NOV 95**

Nef CTL Epitopes

CTL Nef Epitopes

1-42
NOV95

Location	Epitope Comments	Antigen	Species(HLA)	Reference
Nef(66-80 BRU)	VGFPVTPQVPLRMT HIV-1 specific CTLs detected in lymphoid organs of HIV-1 infected patients	HIV-1 infection	human(A1,B8)	[Hadida (1992)]
Nef(73-82 NL432)	QVPLRPMTYK Tyr is critical for binding to A3.1	HIV-1 infection	human(A3.1)	[Koenig (1990)]
Nef(73-82 BRU)	QVPLRPMTYK Nef CTL clones from HIV+ donors	HIV-1 infection	human(A3,A11,B35)	[Culmann (1991)]
Nef(73-82 LAI)	QVPLRPMTYK Development of a retroviral vector (pNeoNef) to generate autologous CTL targets	HIV-1 infection	human(A2)	[Robertson (1993)]
Nef(73-82 LAI)	QVPLRPMTYK Mutational variation in HIV epitopes in individuals with appropriate HLA types can result in evasion of CTL response	HIV-1 infection	human(A11)	[Couillin (1994)]
Nef(73-82)	VPLRPMTYK Exploration of A11 binding motif		human(A11)	[Zhang (1993)]
Nef(73-82 LAI)	VPLRPMTY Review of HIV CTL epitopes; defined by B35 motif found within a larger peptide		human(B35)	[McMichael & Walker(1994)]
Nef(73-82 LAI)	VPLRPMTY VPLRPMTY also recognized by CTL from HIV-2 seropositives, epitope is conserved	HIV-1 or -2 infection	human(B35)	[Rowland-Jones (1995)]
Nef(74-82)	VPLRPMTY Included in A3 binding peptide competition study		human(A3)	[Carreno (1992)]
Nef(75-82 LAI)	PLRPMTYK Review of HIV CTL epitopes; defined by All motif found within a larger peptide	HIV-1 infection	human(A11)	[McMichael & Walker(1994)]
Nef(83-94 BRU)	AAVDLSHFLKEK Epitope defined by boundaries of overlapping peptides that stimulate Nef CTL clones	HIV-1 infection	human(A11)	[Culmann (1991)]
Nef(84-92 LAI)	AVDLSHFLK Review of HIV CTL epitopes; defined by A11 motif found within a larger peptide	HIV-1 infection	human(A11)	[McMichael & Walker(1994)]
Nef(84-92 LAI)	AVDLSHFLK Mutational variation in HIV epitopes in individuals with appropriate HLA types can result in evasion of CTL response	HIV-1 infection	human(A11)	[Couillin (1994)]
Nef(86-100 LAI)	DLSHFLKEKGGLLEGGL Development of a retroviral vector (pNeoNef) to generate autologous targets		human(B35)	[Buseyne (1993)]
Nef(86-100 LAI)	DLSHFLKEKGGLLEGGL Development of a retroviral vector (pNeoNef) to generate autologous targets	HIV-1 infection	human(A2)	[Robertson (1993)]

CTL Nef Epitopes

Location	Epitope Comments	Antigen	Species(HLA)	Reference
Nef(84-92 LAI)	DLSHFLKEK		human(A3.1)	[McMichael & Walker(1994)]
Nef(89-97 LAI)	Review of HIV CTL epitopes; defined by A3.1 motif found within a larger peptide FLKEKGGL		human(B8)	[Brander & Walker(1995)]
Nef(93-106 BRU)	Unpublished, E. Gromard and P. Gould; defined by B8 motif found within a larger peptide in [McMichael & Walker(1994)] EKGGLEGLIHSQRR	HIV-1 infection	human(A1,B8)	[Hadida (1992)]
Nef(103-127 PV22)	HIV-1 specific CTLs detected in lymphoid organs of HIV-1 infected patients SQRRQDILDLWIYHTQGYFPDWQNY	HIV-1 infection	human(B13)	[Jassoy (1993)]
Nef(113-128 BRU)	HIV-1 specific CTLs release γ -IFN, and α - and β -TNF WIYHTQGYFPDWQNYT	HIV-1 infection	human(A1)	[Hadida (1992)]
Nef(113-125 BRU)	HIV-1 specific CTLs detected in lymphoid organs of HIV-1 infected patients WIYHTQGYFPDWQ	HIV-1 infection	human(B17)	[Culmann (1989)]
Nef(115-125 BRU)	Nef CTL clones from HIV+ donors YHTQGYFPQWQ	HIV-1 infection	human(B17)	[Culmann (1991)]
Nef(117-128 BRU)	Nef CTL clones from HIV+ donors TQGYFPDWQNYT	HIV-1 infection	human(B17 and B37)	[Culmann (1991)]
Nef(118-127 LAI)	Nef CTL clones from HIV+ donors QGYFPDWQNY		human(Bw62)	[McMichael & Walker(1994)]
Nef(120-144 SF2)	Review of HIV CTL epitopes; defined by Bw62 motif found within a larger peptide YFPDWQNYTPGPGIRYPLTFGWCYK	HIV-1 infection	human(A24)	[Jassoy (1992)]
Nef(126-138 BRU)	Epitope recognized by CTL clone derived from CSF NYTPGPGVRYPLT	HIV-1 infection	human(B7)	[Culmann (1991)]
Nef(132-147 BRU)	Nef CTL clones from HIV+ donors GVRYPPLTFGWCYKLVP	HIV-1 infection	human(A1,B8)	[Hadida (1992)]
Nef(132-147 BRU)	HIV-1 specific CTLs detected in lymphoid organs GVRYPPLTFGWCYKLVP	HIV-1 infection	human(B18)	[Culmann (1991)]
	Nef CTL clones from HIV+ donors			

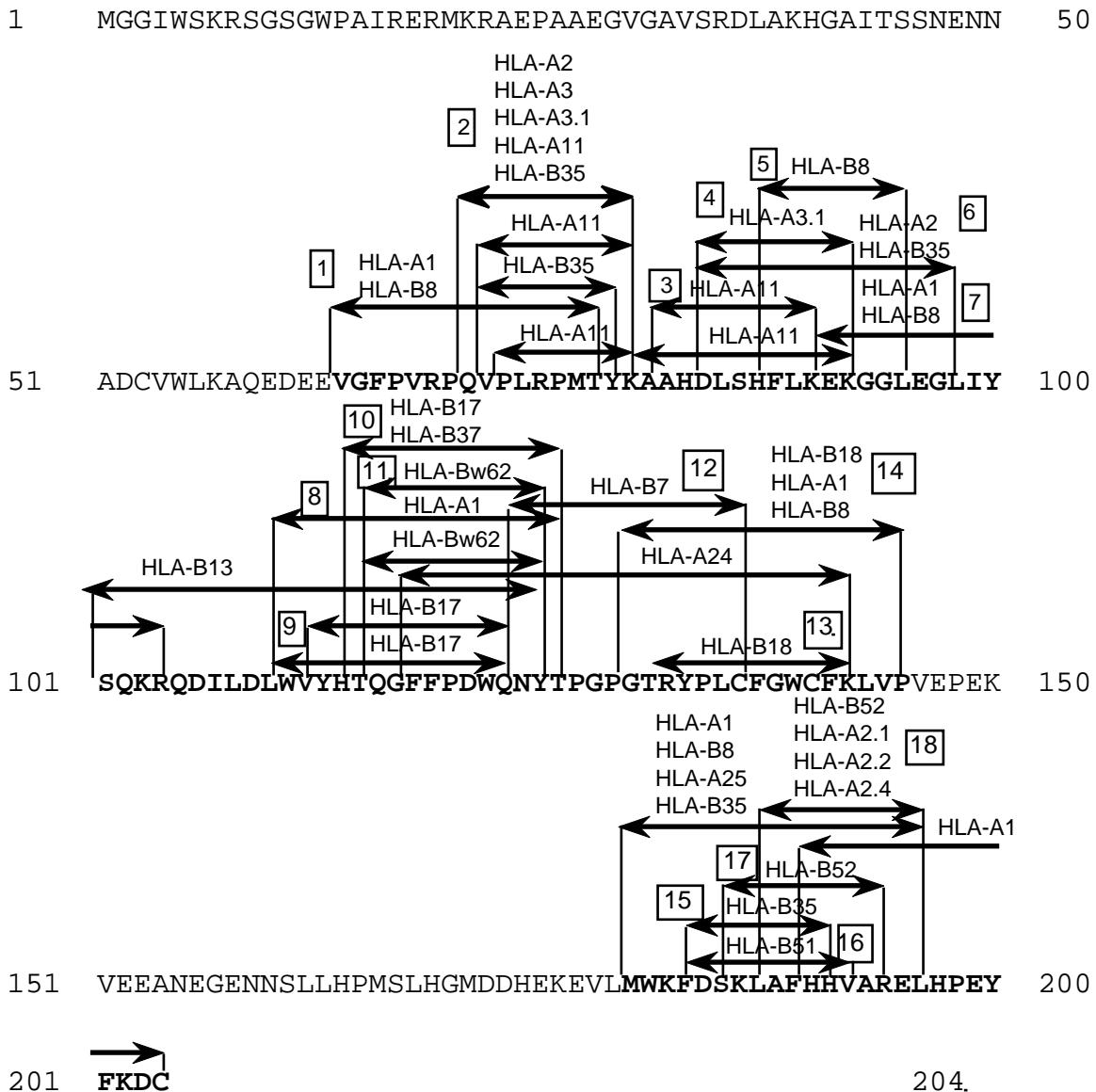
1-143
NOV95

CTL Nef Epitopes

NOV 14

Location	Epitope Comments	Antigen	Species(HLA)	Reference
Nef(134-144 LAI)	RYPLTFGWCYK	HIV-1 infection	human(B18)	[Couillin (1994)]
	Mutational variation in HIV epitopes in individuals with appropriate HLA types can result in evasion of CTL response			
Nef(182-198 BRU)	EWRFDSSLAFHHVAREL	HIV-1 infection	human(A1,B8)	[Hadida (1992)]
	HIV-1 specific CTLs detected in lymphoid organs of HIV-1 infected patients			
Nef(182-198 BRU)	EWRFDSSLAFHHVAREL	HIV-1 infection	human(A25)	[Cheynier (1992)]
	CTL isolated in children born to HIV-1 positive mothers			
Nef(182-198 LAI)	EWRFDSSLAFHHVAREL	HIV-1 infection	human(B35)	[Hadida (1995)]
	The C-terminal region of Nef (182-205) contains multiple CTL epitopes with 5 distinct HLA restrictions			
Nef(182-198 LAI)	EWRFDSSLAFHHVAREL	HIV-1 infection	human(A1,A25(10))	[Hadida (1995)]
	The C-terminal region of Nef (182-205) contains multiple CTL epitopes with 5 distinct HLA restrictions			
Nef(186-193 LAI)	DSRLAFHH	HIV-1 infection	human(B35)	[Hadida (1995)]
	The C-terminal region of Nef (182-205) contains multiple CTL epitopes with 5 distinct HLA restrictions			
Nef(186-194 BRU)	DSRLAFHHV		human(B51)	[Connan (1994)]
	Produced the significant assembly of HLA-B51; anchor residues: V (position 9) and L (position 4)			
Nef(188-196 LAI)	RLAFHHVAR	HIV-1 infection	human(B52)	[Hadida (1995)]
	The C-terminal region of Nef (182-205) contains multiple CTL epitopes with 5 distinct HLA restrictions			
Nef(192-206 BRU)	HHVARELHPEYFKNC	HIV-1 infection	human(A1)	[Hadida (1992)]
	HIV-1 specific CTLs detected in lymphoid organs of HIV-1 infected patients			
Nef(190-198 LAI)	AFHHVAREL	HIV-1 infection	human(B52,A2)	[Hadida (1995)]
	CTL recognition in the context of HLA B52 and A2.1, A2.2 and A2.4; high effector cell frequency			
Nef(190-198 LAI)	AFHHVAREK	HIV-1 infection	human(A3)	[Hadida (1995)]
	Naturally occurring L to K anchor substitution abrogates A2 binding, but permits HLA-A3 binding			

Nef CTL-EPITOPES



HIV CTL Epitopes

Epitopes and protein variability:

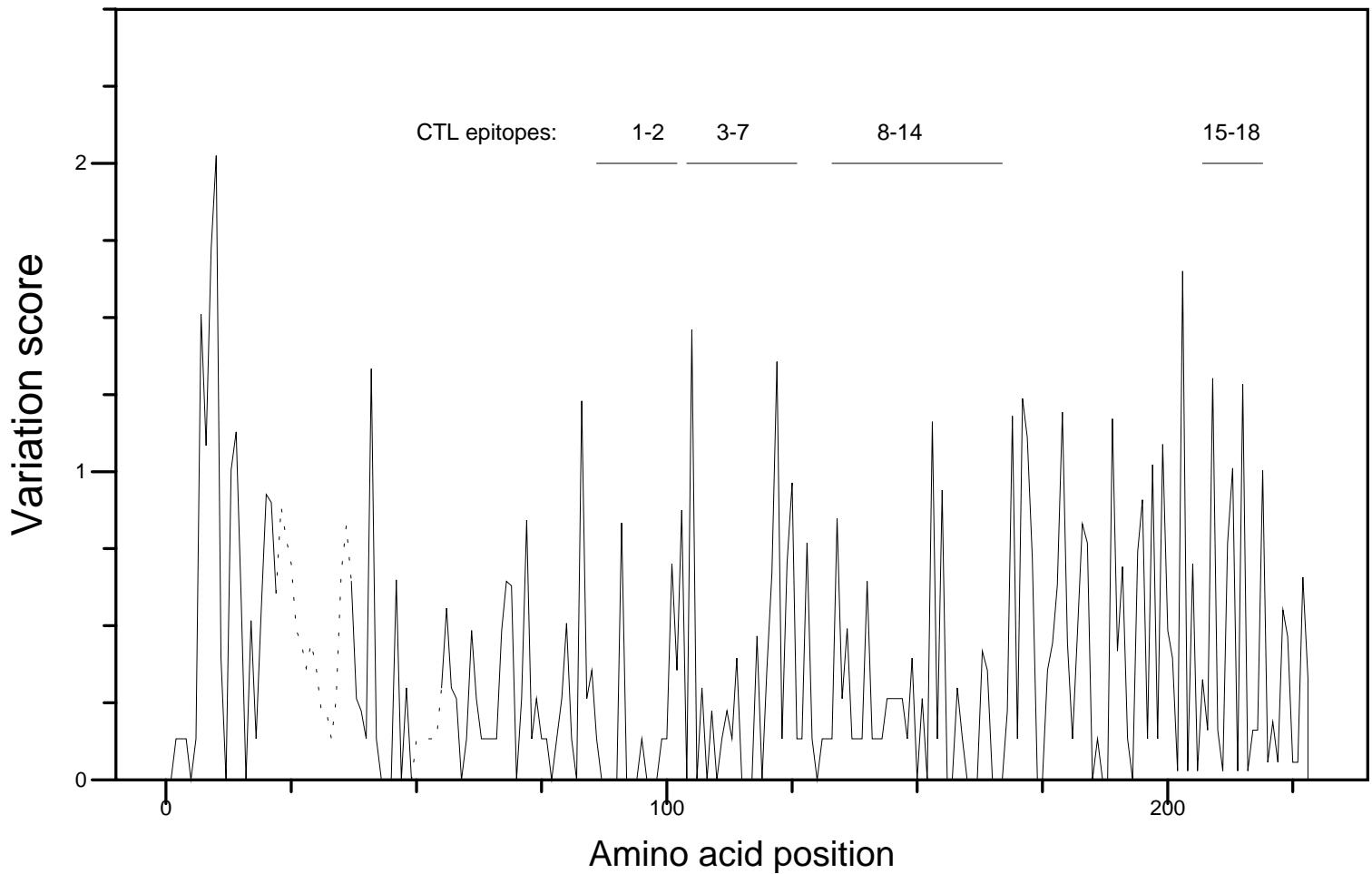
This plot shows a score that is a measure of variability for each position in the Nef protein alignment, and the relative positions of regions with defined CTL epitopes as seen on the CTL epitope map. The solid lines are positions where the most common character in a Nef protein alignment is an amino acid; the dashed lines represent regions where the most common character is an insertion (dash) incorporated to maintain the alignments. The alignment used corresponds to the 1995 Nef protein alignment, publically available at the Human Retroviruses and AIDS database, totaling 34 sequences. See the "how to use the CTL section" information for more details on the variability measure. The higher scores indicate more variation; 0 is perfectly conserved. The different protein alignments (gp120, gp41, p24, p15, p17, Nef and RT) used to create these plots contain different sets of sequences; therefore each plot is internally consistent, but cannot be compared to other protein plots.

Most common amino acid in each position in the Nef protein is shown below. The numbering corresponds to the numbering in the variability plot for the Nef protein.

NEF CONSENSUS:

MGGKWSKSSMVGWP AVRERMRA-----	EPAADGVGAVSRD	50
-----LEKHGAITSSNTAATNADC AWLEAQ--EEEVEGFPVRPQVPLRP M		100
TYKA AVDLSHFLKEKG GLEGLIYSQKRQDILD LWVYHTQGYFPDWQNYTP		150
PG PIRYPLTGF GCFLVP VEPEKVE-E ANE GENNSLLHP MSLHGMD PPER		200
EVLE WRFD SRLAFHH MAR ELHPEYY-KDC		

Variation in positions in the Nef protein



HIV CTL Epitopes

Nef CTL epitope 1

HLA-A1, HLA-B8

CONSENSUS-B VGFPVRPQVPLRPMY
Epitope1 -----T-----

CONSENSUS-A -----
HIVU455 -----

CONSENSUS-B -----
HIVLAI -----T-----
HIVNL43 -----T-----
HIVGLNEF3 -----
HIVGLNEF5 -----T-----
HIVGLNEF6 -----T-----
HIVBRVA -----K-----
HIVMN -----K-----
HIVSC -----
HIVBAL1 -----
HIVJRCSF -----
HIVJRFL -----
HIVNH53 -----
HIVOYI -----
HIVSF2 -----
HIVSF162 -----
HIVCAM1 -----
HIVHEI39BL -----
HIVHEI3BL -----
HIVHEI4BL -----
HIVSF33 -----K-----
HIVSWB84 -----
HIVHAN E-----
HIVD31 -----K-----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----I-

CONSENSUS-D -----
HIVELI -----
HIVNDK -----
HIVZ6 -----

CONSENSUS-O -----?-----
HIVANT70 -----A-----
HIVMVP5180 -----
SIVCPZGAB -----T----

CONSENSUS-U -----
HIVMAL -----
HIVZ321 -----

Nef CTL epitope 2

**HLA-A2, HLA-A3, HLA-A3.1, HLA-11,
HLA-B35**

CONSENSUS-B QVPLRPMTYK
Epitope2 -----
HLA-A3 , B35 -----
HLA-A11 -----

CONSENSUS-A -----
HIVU455 -----

CONSENSUS-B -----
HIVLAI -----
HIVNL43 -----
HIVGLNEF3 -----
HIVGLNEF5 -----
HIVGLNEF6 -----
HIVBRVA -----
HIVMN -----
HIVSC -----
HIVBAL1 -----RS
HIVJRCSF -----
HIVJRFL -----
HIVNH53 -----
HIVOYI -----
HIVSF2 -----
HIVSF162 -----
HIVCAM1 -----
HIVHEI39BL -----SR
HIVHEI3BL -----
HIVHEI4BL -----
HIVSF33 -----
HIVSWB84 -----RR
HIVHAN -----
HIVD31 -----
HIVRF -----F-
HIVYU2 -----H-
HIVBCSG3C -----I--

CONSENSUS-D -----
HIVELI -----
HIVNDK -----
HIVZ6 -----

CONSENSUS-O -----?-
HIVANT70 -----
HIVMVP5180 -----F-

SIVCPZGAB ---T-----
CONSENSUS-U -----?-
HIVMAL -----
HIVZ321 -----F-

Nef CTL epitope 3**HLA-A11**

CONSENSUS-B A?DLSHFLK
Epitope3 -V-----

CONSENSUS-A -F----F---
HIVU455 -F----F---

CONSENSUS-B -----
HIVLAI -V-----
HIVNL43 -V-----
HIVGLNEF3 -V-----
HIVGLNEF5 -V-----
HIVGLNEF6 -V-----
HIVBRVA -V-----
HIVMN -L-----
HIVSC -V-----
HIVBAL1 -I-----F-
HIVJRCSF -I-----
HIVJRFL -V-----
HIVNH53 -V-----
HIVOYI -L-----
HIVSF2 -L-I----
HIVSF162 -L-----
HIVCAM1 -L-I----
HIVHEI20BL -L-----
HIVHEI39BL -R-----
HIVHEI3BL -L-----
HIVHEI4BL -V-----
HIVSF33 -L-----
HIVSWB84 -I-----R
HIVHAN -L-----
HIVD31 -V-----
HIVRF -V-----
HIVYU2 -M-----
HIVBCSG3C -V-I----

CONSENSUS-D -v-----
HIVELI -L-----
HIVNDK -V-----
HIVZ6 -V-----

CONSENSUS-O -F----F---
HIVANT70 -F----F---
HIVMVP5180 -F----F---

SIVCPZGAB -F-----

CONSENSUS-U -F---?---
HIVMAL -F-----
HIVZ321 -F---F---

Nef CTL epitope 4**HLA-A3.1**

CONSENSUS-B DLSHFLKEK
Epitope4 -----

CONSENSUS-A ---F-----
HIVU455 ---F-----

CONSENSUS-B -----
HIVLAI -----
HIVNL43 -----
HIVGLNEF3 -----
HIVGLNEF5 -----
HIVGLNEF6 -----
HIVBRVA -----
HIVMN -----
HIVSC -----Q
HIVBAL1 -----F-K-
HIVJRCSF -----
HIVJRFL -----
HIVNH53 -----T
HIVOYI -----
HIVSF2 -I-----
HIVSF162 -----
HIVCAM1 -I-----
HIVHEI20BL -----N
HIVHEI28BL -----R--
HIVHEI39BL -----
HIVHEI3BL -----
HIVHEI4BL -----
HIVSF33 -----
HIVSWB84 -----R--
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -I-----

CONSENSUS-D -----
HIVELI -----
HIVNDK -----
HIVZ6 -----

CONSENSUS-O ---F-----
HIVANT70 ---F-----
HIVMVP5180 ---F-----

SIVCPZGAB -----

CONSENSUS-U ---?-----
HIVMAL -----
HIVZ321 ---F----

HIV CTL Epitopes

Nef CTL epitope 5

HLA-B8

CONSENSUS-B FLKEKGGL
Epitope5 -----

CONSENSUS-A -----
HIVU455 -----

CONSENSUS-B -----
HIVLAI -----
HIVNL43 -----
HIVGLNEF3 -----
HIVGLNEF5 -----
HIVGLNEF6 -----
HIVBRVA -----
HIVMN -----
HIVSC -----Q---
HIVBAL1 ---F-K---
HIVJRCSF -----
HIVJRFL -----
HIVNH53 -----T---
HIVOYI -----
HIVSF2 -----
HIVSF162 -----
HIVCAM1 -----
HIVHEI20BL ----N---
HIVHEI28BL --R----
HIVHEI39BL -----
HIVHEI3BL -----
HIVHEI4BL -----
HIVSF33 -----
HIVSWB84 --R----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----

CONSENSUS-D -----
HIVELI -----
HIVNDK -----
HIVZ6 -----

CONSENSUS-O -----
HIVANT70 -----
HIVMVP5180 -----

SIVCPZGAB -----

CONSENSUS-U -----
HIVMAL -----
HIVZ321 -----

Nef CTL epitope 6

HLA-A2, HLA-B35

CONSENSUS-B DLSHFLKEKGGLEGL
Epitope6 -----

CONSENSUS-A ---F-----D--
HIVU455 ---F-----D--

CONSENSUS-B -----
HIVLAI -----
HIVNL43 -----
HIVGLNEF3 -----
HIVGLNEF5 -----
HIVGLNEF6 -----
HIVBRVA -----
HIVMN -----D--
HIVSC -----Q---
HIVBAL1 -----F-K---
HIVJRCSF -----
HIVJRFL -----
HIVNH53 -----T---
HIVOYI -----
HIVSF2 ---I----
HIVSF162 -----
HIVCAM1 ---I-----I
HIVHEI20BL -----N---
HIVHEI28BL -----R----
HIVHEI39BL -----D-M
HIVHEI3BL -----I
HIVHEI4BL -----
HIVSF33 -----
HIVSWB84 -----R----
HIVHAN -----
HIVD31 -----
HIVRF -----D--
HIVYU2 -----
HIVBCSG3C ---I----

CONSENSUS-D -----
HIVELI -----
HIVNDK -----
HIVZ6 -----

CONSENSUS-O ---F-----?--
HIVANT70 ---F----
HIVMVP5180 ---F-----D--

SIVCPZGAB -----

CONSENSUS-U ---?-----D--
HIVMAL -----D--
HIVZ321 -----D--

Nef CTL epitope 7**HLA-A1, HLA-B8**

CONSENSUS-B EKGGLEGLI?AQKR
Epitope7 -----HS-R-

CONSENSUS-A -----D---H----
HIVU455 -----D---H----

CONSENSUS-B -----
HIVLAI -----H--R-
HIVNL43 -----H--R-
HIVGLNEF3 -----VH---
HIVGLNEF5 -----TY---
HIVGLNEF6 -----H--R-
HIVBRVA -----H--Q-
HIVMN -----D---Y---
HIVSC -Q-----TPRED
HIVBAL1 K-----H----
HIVJRCSF -----Y---
HIVJRFL -----H----
HIVNH53 -T-----F---
HIVOYI -----Y---
HIVSF2 -----W--R-
HIVSF162 -----Y---
HIVCAM1 -----I-Y--R-
HIVHEI20BL -N-----VY--R-
HIVHEI39BL -----D-M-Y---
HIVHEI3BL -----I-Y---
HIVHEI4BL -----W---
HIVSF33 -----VY---
HIVSWB84 -----VH---
HIVHAN -----Y-P--
HIVD31 -----VH----
HIVRF -----D--VF---
HIVYU2 -----H--Q-
HIVBCSG3C -----F--R-

CONSENSUS-D -----W-K--
HIVELI -----W-K--
HIVNDK -----W-K--
HIVZ6 -----W-K--

CONSENSUS-O -----?---Y-H--
HIVANT70 -----Y-H--
HIVMVP5180 -----D--Y-H--

SIVCPZGAB -----VY-RR-

CONSENSUS-U -----D--?---?--
HIVMAL -----D--VW-P--
HIVZ321 -----D--Y-K--

Nef CTL epitope 8**HLA-A1**

CONSENSUS-B WVYHTQGYFPDWQNYT
Epitope8 -I-----

CONSENSUS-A -----F-----
HIVU455 -----F-----

CONSENSUS-B -----
HIVLAI -I-----
HIVNL43 -I-----
HIVGLNEF3 -----
HIVGLNEF5 -I-----KD-
HIVBRVA -----
HIVMN -----
HIVBAL1 -----
HIVJRCSF -I-----
HIVJRFL -----
HIVNH53 -I-----
HIVOYI -----
HIVSF2 -I-----
HIVSF162 -IH-----
HIVCAM1 -I-----
HIVHEI20BL -----
HIVHEI28BL ---N-----
HIVHEI39BL -----
HIVHEI3BL -----
HIVHEI4BL -----
HIVSF33 -I-----
HIVSWB84 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -T-----

CONSENSUS-D ---N---I-----
HIVELI ---N---I-----
HIVNDK ---N---I-----
HIVZ6 ---N---I-----

CONSENSUS-O -?-?---F-----?--
HIVANT70 ---N---F-----
HIVMVP5180 -I-----F-----C--

SIVCPZGAB -----F-----

CONSENSUS-U -----?-----?--
HIVMAL -----
HIVZ321 -----F---H--

HIV CTL Epitopes

Nef CTL epitope 9

HLA-B17

CONSENSUS-B YHTQQYFPDWQ
Epitope9 -----G---Q--

CONSENSUS-A -----F-----
HIVU455 -----F-----

CONSENSUS-B -----
HIVLAI -----
HIVNL43 -----
HIVGLNEF3 -----
HIVGLNEF5 -----
HIVBRVA -----
HIVMN -----
HIVBAL1 -----
HIVJRCSF -----
HIVJRFL -----
HIVNH53 -----
HIVOYI -----
HIVSF2 -----
HIVSF162 H-----
HIVCAM1 -----
HIVHEI20BL -----
HIVHEI28BL -N-----
HIVHEI39BL -----
HIVHEI3BL -----
HIVHEI4BL -----
HIVSF33 -----
HIVSWB84 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----

CONSENSUS-D -N---I----
HIVELI -N---I----
HIVNDK -N---I----
HIVZ6 -N---I----

CONSENSUS-O -?---F----
HIVANT70 -N---F----
HIVMVP5180 -----F----

SIVCPZGAB -----F----

CONSENSUS-U -----?----?
HIVMAL -----
HIVZ321 -----F---H

Nef CTL epitope 10

HLA-B17, HLA-B37

CONSENSUS-B TQGYFPDWQNYT
Epitope10 -----

CONSENSUS-A ---F-----
HIVU455 ---F-----

CONSENSUS-B -----
HIVLAI -----
HIVNL43 -----
HIVGLNEF3 -----
HIVGLNEF5 -----KD-
HIVBRVA -----
HIVMN -----
HIVBAL1 -----
HIVJRCSF -----
HIVJRFL -----
HIVNH53 -----
HIVOYI -----
HIVSF2 -----
HIVSF162 -----
HIVCAM1 -----
HIVHEI20BL -----
HIVHEI28BL -----
HIVHEI39BL -----
HIVHEI3BL -----
HIVHEI4BL -----
HIVSF33 -----
HIVSWB84 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----

CONSENSUS-D ---I-----
HIVELI ---I-----
HIVNDK ---I-----
HIVZ6 ---I-----

CONSENSUS-O ---F----?--
HIVANT70 ---F-----
HIVMVP5180 ---F----C--

SIVCPZGAB ---F-----

CONSENSUS-U ---?----?---
HIVMAL -----
HIVZ321 ---F---H---

Nef CTL epitope 11

HLA-Bw62

CONSENSUS-B QGYFPDWQNY
Epitope11 -----

CONSENSUS-A --F-----
HIVU455 --F-----

CONSENSUS-B -----
HIVLAI -----
HIVNL43 -----
HIVGLNEF3 -----
HIVGLNEF5 -----KD
HIVBRVA -----
HIVMN -----
HIVBAL1 -----
HIVJRCSF -----
HIVJRFL -----
HIVNH53 -----
HIVOYI -----
HIVSF2 -----
HIVSF162 -----
HIVCAM1 -----
HIVHEI20BL -----
HIVHEI28BL -----
HIVHEI39BL -----
HIVHEI3BL -----
HIVHEI4BL -----
HIVSF33 -----
HIVSWB84 -----
HIVHAN -----
HIVD31 -----
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----

CONSENSUS-D --I-----
HIVELI --I-----
HIVNDK --I-----
HIVZ6 --I-----

CONSENSUS-O --F-----?-
HIVANT70 --F-----
HIVMVP5180 --F-----C-

SIVCPZGAB --F-----

CONSENSUS-U --?----?--
HIVMAL -----
HIVZ321 --F----H--

Nef CTL epitope 12

HLA-B7

CONSENSUS-B NYTPGPG?RYPLT
Epitope12 -----

CONSENSUS-A -----I-----
HIVU455 -----I-----

CONSENSUS-B -----
HIVLAI -----V-----
HIVNL43 -----V-----
HIVGLNEF3 ---S---V-F---
HIVGLNEF5 KD-----V-----
HIVGLNEF6 -----V-----
HIVBRVA -----V-----
HIVMN -----I-----
HIVBAL1 -----T-F---
HIVJRCSF ---A---V-F---
HIVJRFL -----I-F---
HIVNH53 -----I-----
HIVOYI -----I----C
HIVSF2 -----I-----
HIVSF162 -----I-----
HIVCAM1 -----I-----
HIVHEI20BL -----I-----
HIVHEI28BL -----V-W---
HIVHEI39BL -----T-----
HIVHEI3BL -----V-----
HIVHEI4BL -----V-F---
HIVSF33 -----V-F---
HIVSWB84 -----T-W---
HIVHAN -----V-----
HIVD31 -----T-F---
HIVRF -----T-----
HIVYU2 -----T-W---
HIVBCSG3C -----I-----

CONSENSUS-D -----I-----
HIVELI -----I-----
HIVNDK -----I-----
HIVZ6 -----I-----

CONSENSUS-O ?-----F---
HIVANT70 -----T-F---
HIVMVP5180 C-----P-F---

SIVCPZGAB ---T---T-F---C

CONSENSUS-U -----?--?
HIVMAL -----I-F---
HIVZ321 -----T----C

HIV CTL Epitopes

Nef CTL epitope 13

HLA-B18

CONSENSUS-B RYPLTFGWCFK
Epitope13 -----Y-

CONSENSUS-A -----Y-
HIVU455 -----Y-

CONSENSUS-B -----
HIVLAI -----Y-
HIVNL43 -----Y-
HIVGLNEF3 -F-----
HIVGLNEF5 -----
HIVGLNEF6 -----Y-
HIVBRVA -----
HIVMN -----
HIVSC DI---C-----
HIVBAL1 -F-----
HIVJRCSF -F-----
HIVJRFL -F-----
HIVNH53 -----
HIVOYI ---C-----
HIVSF2 -----
HIVSF162 -----
HIVCAM1 -----
HIVHEI20BL -----
HIVHEI28BL -W-----
HIVHEI39BL -----
HIVHEI3BL -----
HIVHEI4BL -F-----
HIVSF33 -F-----
HIVSWB84 -W---P----
HIVHAN -----
HIVD31 -F-----
HIVRF -----
HIVYU2 -W-----
HIVBCSG3C -----

CONSENSUS-D -----e
HIVELI -----YE
HIVNDK -----Q
HIVZ6 -----E

CONSENSUS-O -F-----L--
HIVANT70 -F-----L--
HIVMVP5180 -F-----L--

SIVCPZGAB -F---C-----

CONSENSUS-U -?---?-----
HIVMAL -F-----
HIVZ321 ---C-----

Nef CTL epitope 14

HLA-B18, HLA-A1, HLA-B8

CONSENSUS-B G?RYPLTFGWCFLVLP
Epitope14 -V-----Y---

CONSENSUS-A -I-----Y-
HIVU455 -I-----Y---

CONSENSUS-B -----
HIVLAI -V-----Y-
HIVNL43 -V-----Y-
HIVGLNEF3 -V-F-----
HIVGLNEF5 -V-----
HIVGLNEF6 -V-----Y-
HIVBRVA -V-----
HIVMN -I-----
HIVSC -SDI---C-----
HIVBAL1 -T-F-----
HIVJRCSF -V-F-----
HIVJRFL -I-F-----
HIVNH53 -I-----
HIVOYI -I---C-----
HIVSF2 -I-----
HIVSF162 -I-----
HIVCAM1 -I-----
HIVHEI20BL -I-----
HIVHEI28BL -V-W-----
HIVHEI39BL -T-----
HIVHEI3BL -V-----
HIVHEI4BL -V-F-----
HIVSF33 -V-F-----
HIVSWB84 -T-W---P----
HIVHAN -V-----
HIVD31 -T-F-----
HIVRF -T-----
HIVYU2 -T-W-----
HIVBCSG3C -I-----

CONSENSUS-D -I-----e---
HIVELI -I-----YE---
HIVNDK -I-----Q---
HIVZ6 -I-----E---

CONSENSUS-O -F-----L---
HIVANT70 -T-F-----L---
HIVMVP5180 -P-F-----L---

SIVCPZGAB -T-F---C-----

CONSENSUS-U -?---?-----
HIVMAL -I-F-----
HIVZ321 -T---C-----

Nef CTL epitope 15**HLA-B35**

CONSENSUS-B DSRLAFHH
Epitope15 -----

CONSENSUS-A --T---LK-
HIVU455 --T---LK-

CONSENSUS-B -----
HIVLAI -----
HIVNL43 -----
HIVGLNEF3 -----
HIVGLNEF5 -----
HIVGLNEF6 -----
HIVBRVA -----
HIVSC -N-----
HIVBAL1 --S-----
HIVJRCSF --K--L--
HIVJRFL --K-----
HIVNH53 --H-----
HIVOYI -----R-
HIVSF2 --K-----
HIVSF162 -----
HIVCAM1 -----
HIVHEI28BL ----Y--
HIVHEI39BL --Q----
HIVHEI4BL -----
HIVSF33 --H---R-
HIVSWB84 --S-----
HIVHAN --H-----
HIVD31 -----K-
HIVRF -----
HIVYU2 -----
HIVBCSG3C -----

CONSENSUS-D N-----E-
HIVELI N-----E-
HIVNDK N-----LE-
HIVZ6 N-----E-

CONSENSUS-O -RS-G?T-
HIVANT70 -RS-GNT-
HIVMVP5180 -RS-GLT-

SIVCPZGAB -----LR-

CONSENSUS-U --S--??-
HIVMAL --S--LR-
HIVZ321 --S--RK-

Nef CTL epitope 16**HLA-B51**

CONSENSUS-B DSRLAFHHM
Epitope16 -----V

CONSENSUS-A --T---LK-R
HIVU455 --T---LK-R

CONSENSUS-B -----
HIVLAI -----V
HIVNL43 -----V
HIVGLNEF3 -----V
HIVGLNEF5 -----
HIVGLNEF6 -----V
HIVBRVA -----
HIVSC -N-----
HIVBAL1 --S-----V
HIVJRCSF --K--L--V
HIVJRFL --K-----V
HIVNH53 --H-----
HIVOYI -----R--
HIVSF2 --K-----
HIVSF162 -----
HIVCAM1 -----
HIVHEI28BL ----Y--
HIVHEI39BL --Q----V
HIVHEI3BL --x----V
HIVHEI4BL -----
HIVSF33 --H---R--
HIVSWB84 --S-----K
HIVHAN --H-----K
HIVD31 -----K--
HIVRF -----V
HIVYU2 -----V
HIVBCSG3C -----

CONSENSUS-D N-----E-K
HIVELI N-----E-K
HIVNDK N-----LE-K
HIVZ6 N-----E-K

CONSENSUS-O -RS-G?T-?
HIVANT70 -RS-GNT-V
HIVMVP5180 -RS-GLT-I

SIVCPZGAB -----LR-I

CONSENSUS-U --S--??-?
HIVMAL --S--LR-R
HIVZ321 --S--RK-L

HIV CTL Epitopes

Nef CTL epitope 17

HLA-B52

CONSENSUS-B RLAFHHMAR

Epitope17 -----V--

CONSENSUS-A T--LK-R-Y

HIVU455 T--LK-R-Y

CONSENSUS-B -----

HIVLAI -----V--

HIVNL43 -----V--

HIVGLNEF3 -----V--

HIVGLNEF5 -----

HIVGLNEF6 -----V--

HIVBRVA -----

HIVSC -----

HIVBAL1 S-----V--

HIVJRCSF K--L--V--

HIVJRFL K-----V--

HIVNH53 H-----

HIVOYI ----R----

HIVSF2 K-----

HIVSF162 -----

HIVCAM1 -----

HIVHEI28BL ---Y-----

HIVHEI39BL Q-----V--

HIVHEI4BL -----

HIVSF33 H---R----

HIVSWB84 S-----K--

HIVHAN H-----K--

HIVD31 ----K----

HIVRF -----V--

HIVYU2 -----V--

HIVBCSG3C -----

CONSENSUS-D ----E-K--

HIVELI -----E-K--

HIVNDK ---LE-K--

HIVZ6 -----E-K--

CONSENSUS-O S-G?T-?-?

HIVANT70 S-GNT-V-M

HIVMVP5180 S-GLT-I-L

SIVCPZGAB ---LR-I--

CONSENSUS-U S--??-?--

HIVMAL S--LR-R--

HIVZ321 S--RK-L--

Nef CTL epitope 18

HLA-B52, HLA-A2.1, HLA-A2.2, HLA-A2.4

CONSENSUS-B AFHHMAREL

Epitope18 -----V----

CONSENSUS-A -LK-R-Y--

HIVU455 -LK-R-Y--

CONSENSUS-B -----

HIVLAI -----V--

HIVNL43 -----V--

HIVGLNEF3 -----V--

HIVGLNEF5 -----K

HIVGLNEF6 -----V--

HIVBRVA -----

HIVSC -----D-

HIVBAL1 -----V--

HIVJRCSF -L--V----

HIVJRFL -----V--

HIVNH53 -----

HIVOYI --R-----V

HIVSF2 -----

HIVSF162 -----

HIVCAM1 -----K

HIVHEI28BL -Y-----

HIVHEI39BL -----V--

HIVHEI4BL -----

HIVSF33 -----V--

HIVSWB84 -----

HIVHAN -----R----

HIVD31 -----K----

HIVRF -----V--K

HIVYU2 -----V--

HIVBCSG3C -----

CONSENSUS-D --E-K---m

HIVELI --E-K---M

HIVNDK -LE-K----

HIVZ6 --E-K---M

CONSENSUS-O G?T-?-???

HIVANT70 GNT-V-MIT

HIVMVP5180 GLT-I-LQK

SIVCPZGAB -LR-I---Q

CONSENSUS-U -??-?---?

HIVMAL -LR-R---Q

HIVZ321 -RK-L---M

CTL Epitopes Sorted by HLA Restricting Element

HIV HLA-A1 Epitopes:

Anchor residues: 2 (TSM), 3 (DE), 4 (P), C term (Y) [Kast (1994), DiBrino (1994b)]
 HLA-A1 Anchor/auxiliary residues: 2 (TS), 3(**DE**), 4 (P), 7 (L), 9 (**Y**) [Rammensee (1995)]

Location	Epitope	HLA specificity	Reference
Nef(66-80 BRU)	VGFPVTPQVPLRPMT	A1,B8	[Hadida (1992)]
Nef(93-106 BRU)	EKGGLEGLIHSQRR	A1,B8	[Hadida (1992)]
Nef(113-128 BRU)	WIYHTQGYFPDWQNYT	A1	[Hadida (1992)]
Nef(132-147 BRU)	GVRYPLTFGWCYKLVP	A1,B8	[Hadida (1992)]
Nef(182-198 BRU)	EWRFDSRLAFHHVAREL	A1,B8,B35	[Hadida (1992), Hadida (1995)]
Nef(192-206 BRU)	HHVARELHPEYFKNC	A1	[Hadida (1992)]

HIV HLA-A2 Epitopes:

Anchor residues: 2 (LI), C term (VL)	[Falk (1991), McMichael & Walker(1994)]
HLA-A*0201 Anchor/auxiliary residues: 2 (LM), 6 (V), 9 (VL)	[Rammensee (1995)]
HLA-A*0205 Anchor/auxiliary positions: 2 (VLIM), 6 (IVLA), 9 term (L)	[Rammensee (1995)]
p17(77-85 LAI) SLYNTVATL	A2 [Parker (1992), Parker (1994), Tsomides (1994)]
p17(88-115 ARV) VHQRIEIKDTKEALDKIEEEQNKSKKKA	A2 [Achour (1990)]
p24(151-159) TLNAWVKVV	A2 [Parker (1992), Parker (1994)]
p24(193-203 BRU) GHQAAMQMLKE	A2 [Claverie (1988)]
p24(219-233 BRU) HAGPIAPGQMREPRG	A2 [Claverie (1988)]
p24(263-279) KRWIILGLNKIYRMYC	A2 [Chen (1990)]
p15(418-433 BRU) KEGHQMKDCTERQANF	A2 [Claverie (1988), Kast (1994)]
p15(446-460 BRU) GNFLQSRPEPTAPPF	A2 [Claverie (1988)]
RT(346-354 LAI) VIYQYMDDL	A2 [McMichael & Walker(1994), Brander & Walker(1995)]
RT(476-484 LAI) ILKEPVHGV	A2 [Tsomides (1994), Parker (1992), Connan (1994)]
RT(640-648 HXB2R) ALQDSGLEV	A2 [Brander (1995)]
RT(956-964 HXB2R) LLWKGEGAV	A2 [Parker (1992), Parker (1994), Brander (1995)]

HIV HLA-A2 Epitopes Continued:

Anchor residues: 2 (LI), C term (VL)

HLA-A*0201 Anchor/auxiliary residues: 2 (**LM**), 6 (V), 9 (**VL**)

HLA-A*0205 Anchor/auxiliary positions: 2 (VLIM), 6 (IVLA), 9 term (**L**)

gp120(25-46 BRU)	<u>LWVTVYYGVP</u> V WKE A TTT <u>L</u> FCA	A2	[Dadaglio (1991)]
gp120(32-41 LAI)	K <u>LWVTVYYGV</u>	A2?	[Dupuis (1995)]
gp120(112-124 IIIB)	<u>HEDI</u> I SLWDQSLK	A2	[Clerici (1991)]
gp120(120-128 LAI)	<u>KTLPLCVTL</u>	A2?	[Dupuis (1995)]
gp120(192-199 HXB2R)	K <u>LTSCNTSV</u>	A2	[Dadaglio (1991), Brander (1995)]
gp120(197-205 HXB2R)	T <u>LTSCNTSV</u>	A2	[Garboczi (1992)]
gp120(295-312 BRU)	SVEINCTRPNNNTRKSI	A2	[Dadaglio (1991)]
gp120(315-329 IIIB)	RIQRGPGRAFVTIGK	A2,A11,A3	[Dadaglio (1991), Clerici (1991)]
gp120(374-380 BRU)	PEIVTHS	A2	[Dadaglio (1991)]
gp120(377-387)	NSGGEFFYSNS	A2	[Hickling (1990)]
gp120(381-392 BRU)	KNCGGEFFYCNS	A2	[Dadaglio (1991)]
gp120(428-443 IIIB)	KQIINMWQEVGKAMY	A2	[Cease (1987), Clerici (1991)]
gp120(421-440 LAI)	KQFINMWQEVGKAMY	A2	[Dadaglio (1991)]
gp120(494-513 BRU)	VKIEPLGVAPTKAKRRVVQR	A2	[Dadaglio (1991)]
gp41(747-755)	R <u>LVNGSLAL</u>	A2	[Parker (1992)]
gp41(814-823 LAI)	S <u>LLNATDIAV</u>	A2	[Dupuis (1995)]
gp41(834-848 IIIB)	DRVIEVVQGAYRAIR	A2	[Clerici (1991)]
gp41(829-837 LAI)	R <u>VIEVLQRA</u>	A2?	[Dupuis (1995)]
Nef(73-82 LAI)	QVPLRPMTYK	A2	[Robertson (1993)]
Nef(86-100 LAI)	DLSHFLKEKG G <u>LEG</u> L	A2,B35	[Robertson (1993)]
Nef(190-198 LAI)	AFHHVARE L	A2	[Hadida (1995)]

HIV HLA-A3.1 Epitopes:

Anchor residues: 2 (IL), 3 (F), C term (KY)

p17(18-26 LAI)	K<u>I</u>RRLRP<u>G</u>GG<u>K</u>	A3.1	[DiBrino (1993), McMichael & Walker(1994)]
p17(20-29)	R<u>L</u>RPGGGKK<u>Y</u>	A3.1,Bw62	[McMichael & Walker(1994), Brander & Walker(1995)]
RT(325-333)	A<u>I</u>FQSSMT<u>K</u>	A3.1,A11,A33	[Brander & Walker(1995)]
gp120(37-46 LAI)	T<u>V</u>YYGVPVW<u>K</u>	A3.1	[Johnson (1994a), Hammond (1995)]
gp41(768-778 NL43)	R<u>L</u>R<u>D</u>LLLIVTR	A3.1,A31	[Takahashi (1991), McMichael & Walker(1994)]
Nef(73-82 NL432)	QVPLRP<u>M</u>TY<u>K</u>	A2,A3.1	[Koenig (1990), Culmann (1991), DiBrino (1993)]
Nef(84-92 LAI)	D<u>L</u>SHFLKE<u>K</u>	A3.1	[Culmann (1991), McMichael & Walker(1994)]

HIV HLA-A3 Epitopes:

HLA-A3 Anchor/auxiliary residues: 2 (**L**VM), 3 (FY), 6 (IMFVLT), 7 (ILMF), 9 (**K**YF), 10 (K) [Rammensee (1995)]

gp120(315-329 IIIB)	R<u>I</u>QRGP<u>G</u>RAFV<u>T</u>IG<u>K</u>	A2,A3,A11	[Achour (1993)]
Nef(73-82 BRU)	QVPLRP<u>M</u>TY<u>K</u>	A3,A11,B35	[Culmann (1991)]
Nef(73-82 BRU)	VPLRP<u>M</u>TY<u>K</u>	A3,B35	[Carreno (1992)]
Nef(190-198 LAI)	AFHHVARE<u>K</u>	A3	[Hadida (1995)]

HIV HLA-A11 Epitopes:

Anchor residues: 2 (IL), C term (K)	[Zhang (1993), McMichael & Walker(1994)]
HLA-A*1101 Anchor/auxiliary residues: 2 (VIFY), 3 (MLFYIA), 7 (LIYVF), 9 (K), 10 (K), 11(K)	[Rammensee (1995)]
p17(84-92) T<u>L</u>YCVHQRI	A11
RT(325-333 LAI) A<u>IF</u>QSSMT<u>K</u>	A3.1,A11,A33
RT(325-349) AIFQSSMT <u>K</u> ILEPFRKQNPDIVIYQ	A11
RT(342-366 LAI) NPDIVIYQYMDDLYVGSDLEIGQHR	A11
RT(507-519 LAI) QIYQEPFKNLKTG	A11
gp120(315-329 IIIB) RIQRGPGR <u>A</u> FVT <u>I</u> G <u>K</u>	A2,A3,A11
Nef(75-82 LAI) QVPL <u>R</u> PMTY <u>K</u>	A11
Nef(75-82 LAI) P <u>L</u> RPMTY <u>K</u>	A11
Nef(84-92 LAI) A <u>V</u> DLSH <u>F</u> L <u>K</u>	A11

HIV HLA-A24 Epitopes:

Anchor/auxiliary residues: 2 (Y), 5 (IV), 6 (F), 9 (ILF)		[Rammensee (1995)]
gp120(53-62 LAI) LFCASCAKAY	A24	[Brander & Walker(1995)]
gp41(584-591 NL43) <u>Y</u> LKDQQ <u>L</u>	A24,B8	[Dai (1992)]
Nef(120-144 SF2) YFPDWQNYTPGPG <u>I</u> RYP <u>L</u> TFGWCYK	A24	[Jassoy (1992)]

HIV HLA-A25 Epitopes:

Nef(182-198 LAI) EWRFDSRLAFHHVAREL A25 [Cheynier (1992), Hadida (1995)]

HIV HLA-A26 Epitopes:

p24(164-183) AFSPEVIPMFSALSEGATPQ A26 P. Goulder, per. comm.

HIV HLA-A30 Epitopes:

gp41(854-863 HXB2) RRIRQGLERILL A30 and B8 [Lieberman (1992)]

HIV HLA-A31 Epitopes:

HLA-A*3101 Anchor/auxiliary residues: 2 (LVYF), 3 (FLYW), 6 (LFVI), 9 (**R**) [Rammensee (1995)]

gp41(606-614 LAI) SYHRLRDLLLIVTR human(A31) [Hammond (1995)]

gp41(770-780 BH10) RLRDLLLIVTR A3.1,A31 [Safrit (1994a), Safrit (1994b)]

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HIV HLA-A32 Epitopes:

gp41(701-720 BH10) VLSIVNRVRQGYSPLSFQTH A32 [Safrit (1994a)]

HIV HLA-A33 Epitopes:

HLA-A*3302 Anchor/auxiliary residues: 2 (AILFYV), 9 (**R**) [Rammensee (1995)]

p17(121-132 HXB2R) DTGHSNQVSQNY A33,B27 [Buseyne (1993)]

p24(263-277 LAI) KRWIILGLNKIVMRY A33 [Buseyne (1993)]

RT(325-333 LAI) AIFQSSMTK A3.1,A11,A33 K. Ariyoshi, unpublished

HIV HLA-B7 Epitopes:

Anchor residues: 1 (A), 2 (P), 3 (R), and C term (LV)

Anchor/auxiliary positions: 2 (**P**), 3 (R), 9 (**LF**)

RT(308-320)	WKGSPAIFQSSMT	B7
gp120(32-56)	TEKLWVTVYYGVPVVKEATTLFCA	B7
gp120(302-312 HXB2)	R PNNNTRKSI	B7,B18
gp41(848-856 LAI)	I PRRIRQGL	B7
Nef(126-138 BRU)	NYT P PGPVRYPLT	B7

[Englehard (1993), McMichael & Walker(1994)]

[Rammensee (1995)]

Brander & Walker(1995)]
[Johnson & Walker(1994)]
[Safrit (1994b), Hammond (1995)]
[Brander & Walker(1995)]
[Culmann (1991)]

HIV HLA-B8 Epitopes:

Anchor residues: 3 (K), 5 (K), and C terminus (I)

Anchor/auxiliary residues: 3 (**K**), 5 (**KR**), 9 (**L**)

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p17(24-32 LAI)	GG KKK YKL	B8
p17(93-101)	E I KDTKEAL	B8
p24(259-267 LAI)	GEIY K RWII	B8
p24(329-337 LAI)	D C KTILKAL	B8
RT(185-193 LAI)	G P KV K QWPL	B8
gp41(586-593)	YL K DQQLL	A24,B8
gp41(844-863 HXB2)	YRAIRHIPRRIRQGLERILL	B8
gp41(852-863 HXB2)	R R I RQGLERILL	A30,B8
Nef(66-80 BRU)	VGFPVTPQVPLRMT	A1 and B8
Nef(89-97 LAI)	F L K EKGGL	B8
Nef(93-106 BRU)	EKGGLEGLIHSQRR	A1,B8
Nef(132-147 BRU)	GVRYPLTFGWCYKLVP	A1,B8
Nef(182-198 BRU)	EWRFDSRLAFHHVAREL	A1,B8,A25,B35

[Sutton (1993), Hill (1992), McMichael & Walker(1994)]

[Rammensee (1995)]

S. Reid, submitted
[DiBrino (1994b)]
[Sutton (1993), Klenerman (1994), Nowak (1995)]
[Sutton (1993), Nowak (1995)]
[Sutton (1993), Nixon & McMicheal(1991), Phillips (1991)]
[Dai (1992), Johnson (1992), Sutton (1993)]
[Lieberman (1992)]
[Lieberman (1992)]
[Hadida (1992)]
[McMichael & Walker(1994)]
[Hadida (1992)]
[Hadida (1992)]
[Hadida (1992), Cheynier (1992), Hadida (1995)]

HIV HLA-B12(44) Epitopes:

p24(169-184 LAI) IPMFSALSEGATPQDL B12(44) [Buseyne (1993)]

HIV HLA-B13 Epitopes:

Nef(103-127 PV22) SQRRQDILDLWIYHTQGYFPDWQNY B13 [Jassoy (1993)]

HIV HLA-B14 Epitopes:

Anchor/auxiliary positions: 2 (RK), 3 (LYF), 5 (GH), 6 (IL), 9 (L) [DiBrino (1994a)]

p24(183-191 LAI)	DLNTMLNTV	B14	[Nixon & McMichael(1988), Johnson (1991), McMichael & Walker(1994)]
p24(298-306 LAI)	<u>D</u> RFWKTLRA	B14	[Brander & Walker(1995), McMichael & Walker(1994)]
RT(648-672)	ALQDSGLEVVTD sqy ALGI	B14	[Brander & Walker(1995)]
RT(663-672 LAI)	VTDS sqy ALGI	B14	[Kalams (1994), Brander & Walker(1995)]
gp41(584-592 HXB2)	<u>E</u> RYLK dqql	B14	[Jassoy (1993), Kalams (1994), DiBrino (1994a)]

HIV HLA-B17 Epitopes:

Nef(115-125 BRU)	YHTQGYFPQWQ	B17	[Culmann (1991)]
Nef(117-128 BRU)	TQGYFPDWQNYT	B17,B37	[Culmann (1991)]

HIV HLA-B18 Epitopes:

gp120(32-56)	TEKLWVTVYYGVPVWKEATTLFCA	B7,B18	[Johnson (1994a), Hammond (1995)]
Nef(132-147 BRU)	GVRYPLTFGWCYKLVP	A11,B18	[Culmann (1991)]
Nef(134-144 LAI)	RYPLTFGWCYK	B18	[Couillin (1994)]

HIV HLA-B27 Epitopes:

Anchor residues: 2 (R) C term (KR) [Jardetzky (1991), McMichael & Walker(1994)]

HLA-B*2702 Anchor/auxiliary positions: 2 (**R**), 9 (**FYILW**) [Rammensee (1995)]

HLA-B*2705 Anchor/auxiliary positions: 2 (**R**), 9 (**LFYMIRHK**) [Rammensee (1995)]

p24(263-272 LAI)	K <u>R</u> WIILGLN <u>K</u>	B27	[Klenerman (1994), McMichael & Walker(1994), Nowak (1995)]
gp120(312-320 LAI)	<u>G</u> RAFVTIG <u>K</u>	B27	[Jardetzky (1991), Parker (1992)]
gp41(791-799 LAI)	<u>G</u> RRGWEAL <u>K</u>	B27	[McMichael & Walker(1994), Lieberman (1992)]

HIV HLA-B35 Epitopes:

Anchor residues: 2 (P), C term (Y)			[Hill (1992), McMichael & Walker(1994)]
HLA-B*3501 Anchor/auxiliary residues: 2 (P), 9(YFLMI), 10 (Y)			[Rammensee (1995)]
p17(130-138)	<u>NSSKVSQNY</u>	B35	[Rowland-Jones (1995)]
p17(130-138 HIV-2) P <u>PSGKGGNY</u>	B 35		
p24(260-268 LAI)	<u>PIPVGDIY</u>	B35	[Rowland-Jones (1995)]
p24(245-253 HIV-2)	<u>N</u> <u>PVPVGNI</u> Y	B35	[Rowland-Jones (1995)]
RT(342-350 LAI)	<u>H</u> <u>PDIVIYQ</u> Y	B35	[Rowland-Jones (1995)]
RT(342-350 HIV-2)	<u>N</u> <u>PDVILIQ</u> Y	B35	[Rowland-Jones (1995)]
gp120(42-52 PV22)	<u>V</u> <u>PVWKEATT</u> TL	B35	[Brander & Walker(1995)]
gp41(605-615 LAI)	TAVPWNASW	B35	[Johnson (1994a), Hammond (1995)]
Nef(73-82 LAI)	<u>V</u> <u>PLRPMT</u> Y	B35,A3	[Culmann (1991), Rowland-Jones (1995)]
Nef(86-100 LAI)	DLSHFLKEKGLEG	A2,B35	[Buseyne (1993)]
Nef(182-198 LAI)	EWRFDSRLAFHHVAREL	A1,B8,A25,B35	[Hadida (1995), Buseyne (1993)]
Nef(186-193 LAI)	DSRLAFHH	B35	[Hadida (1995)]

HIV HLA-B37 Epitopes:

HLA-B*3701 Anchor/auxiliary residues: 2 (DE), 5 (VI), 8 (FML), 9 (IL)		[Rammensee (1995)]
p24(265-279)	KRWIILGLNKIVRMYC	B37
Nef(117-128 BRU)	TQGYFPDWQNYT	B17,B37

HIV HLA-B51 Epitopes:

HLA-B5101 Anchor/auxiliary residues: 2 (APG) 9 (FI)		[Rammensee (1995)]
HLA-B5102 Anchor/auxiliary residues: 2 (PAG), 3 (Y), 9 (IV)		[Rammensee (1995)]
HLA-B5103 Anchor/auxiliary residues: 2 (APG), 3 (Y), 9 (VIF)		[Rammensee (1995)]
HLA-B51 Anchor/auxiliary residues: 2 (P), 3 or 4 (VL), 9 (VLI)		[Connan (1994)]
p24(324-335 PV22)	QNANPDCKTILK	B51
Nef(186-194 BRU)	DSRL <u>A</u> FHH V	B51

HIV HLA-B52 Epitopes:

HLA-B5201 Anchor/auxiliary residues: 2 (Q), 3 (FYI), 5 (LIV), 8 (**IV**), 9 (**IV**) [Rammensee (1995)]

Nef(188-196 LAI) RLAFFHVAR B52 [Hadida (1995)]

Nef(190-198 LAI) AFHHVAREL B52 [Hadida (1995)]

HIV HLA-B53 Epitopes:

Anchor residues: 2 (P), C term (YFW) [Hill (1992), McMichael & Walker(1994)]

Anchor/auxiliary residues: 2 (**P**) [Rammensee (1995)]

p17(173-181 HIV-2) TPYDINQML B53 [Gotch (1993)]

HIV HLA-B55 Epitopes:

gp120(42-51 PV22) VPVWKEATTT B55 [Brander & Walker(1995)]

HIV HLA-B57 Epitopes:

p24(105-114) TSTLQEIQIGW B57,B5801 P. Goulder, per. comm.

p24(147-155 PV22) ISPRTLNAW B57 [Johnson (1991), Brander & Walker(1995)]

HIV HLA-B58 Epitopes:

p24(105-114) TSTLQEIQIGW B57,B5801 P. Goulder, per. comm.

HIV HLA-Bw52 Epitopes:

p24(193-214 BH10) GHQAAMQMLKETINEEAAEWDR Bw52 [Johnson (1991)]

CTL References

References

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NOTE: (Medline: 93124561) Using autologous Epstein-Barr virus transformed cells that were infected with vaccinia constructs carrying p18, p24 and p55 proteins of LAI, or truncations of p24, it was shown that epitopes within p24 were most commonly recognized in a set of cell lines derived from 29 infected subjects. The autologous transformed cells coated with synthetic peptides were used to identify several regions of p24

where CTL epitopes tended to cluster. HLA restriction was determined CTL responsive to four of the peptides. Among the four epitopes that had determined HLA specificities were the two peptides in the study that proved to stimulate CTL from the highest fraction of the cell lines: peptide p24(263-272) HLA-B27 and peptide p24(256-270) HLA-A33; these peptides were each able to stimulate CTL response from 14% of the cell lines.

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NOTE: (Medline: 92387221) CTL effectors that killed HLA-matched HIV-1-infected H9 target cells or doubly transfected P815-A2-env, gag or nef mouse tumor cells, which expressed the viral antigens in association with HLA-A1/A3 or HLA-A2, were isolated in children born to HIV-1-infected mothers. HIV-1-specific CTL were detected less than 2 months after birth, and declined with disease progression. CTL were detected in the PBMC of three children who subsequently became seronegative.

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NOTE: (Medline: 89052758) Based on what was known about epitope structure and amino acid frequencies in 1988, the authors predicted epitopes in the gag proteins. Four peptides that were predicted to contain epitopes were found to specifically stimulate an HLA-A2 restricted polyclonal CTL cell line, when presented by mouse P815 target cells that had been transfected with HLA-A2.

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NOTE: (Medline: 94170859) Peptides from influenza and HIV-1 tested for their ability to promote the assembly of HLA-A2 and HLA-B51 molecules in T2 cell lysates. HIV Pol 476-484 allowed significant assembly of HLA-A2, and is a target for CTL. Nef peptide 186-194 produced significant assembly of HLA-B51. A hydrophobic anchor residue (V, L, I) at position 9 could occupy pocket F, and a hydrophobic residue (V, L) at position 3 or 4 may anchor to hydrophobic pocket D of HLA-B51. Proline at position 2 increases HLA-B51 anchoring.

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NOTE: (Medline: 91132023) Nef specific CTL were generated from six seropositive donors. Six epitopes were defined, all localized to two regions in the central part of nef. Some epitopes could be recognized in the contexts of several HLA class I molecules. Peptides were based on BRU epitopes: QVPLRPMTYK HLA A3, A11, B35; AAVDLSHFLKEK HLA A11; HTQGYFPQWQ, HLA B17; TQGYFPQWQNYT, HLA B17, B37; NYTPGPGVRYPLT, HLA B7; and GVRYPLTFGWCYKLVP, HLA B18).

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NOTE: (Medline: 95271010) Two peptide processing pathways are utilized for MHC class I presentation of of HIV-1 env epitopes. The

previously characterized TAP-1 and TAP-2 dependent pathway can generate all env epitopes and uses env protein mislocalized in the cytosol to produce peptides. The second, novel pathway uses a TAP-1/2 independent pathway, and allows a subset of MHC restricted epitopes to be processed in the endoplasmic reticulum or a premidial Golgi compartment.

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NOTE: (Medline: 91132009) A HLA DPw4.2 human CTL epitope located in gp41 was described, recognized by CD4+ CTL clones that were induced in seronegative humans by immunization with recombinant gp160 BRU. gp41 CTL epitope: GIKQLQARILAVERYLKDQ.

[Hickling (1990)] J. K. Hickling, C. M. Fenton, K. Howland, S. G. Marsh, & J. B. Rothbard. Peptides recognized by class I restricted T-cells also bind to MHC class II molecules. *International Immunology* **2**:435–441, 1990.

NOTE: (Medline: 91197875) Peptides shown to be presented in the context of MHC class I proteins by mouse or human CD8+ T lymphocytes could also bind to HLA-DR molecules on the surface of B lymphoblastoid cell lines (B-LCL). Four out of five class I restricted T cell determinants bound, including the HIV-1 gp120 epitope.

[Hill (1992)] A. V. Hill, J. Elvin, & A. C. W. et al. Characteristics of peptides eluted from HLA-B7. *Nature* **360**:434–439, 1992.

NOTE: (Medline: 93078872).

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NOTE: (Medline: 90192804).

[Jardetzky (1991)] T. S. Jardetzky, W. S. Lane, R. A. Robinson, D. R. Madden, & D. C. Wiley. Characteristics of peptides eluted from HLA B7. *Nature* **353**:326–329, 1991.

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[Jassoy (1993)] C. Jassoy, T. Harrer, T. Rosenthal, B. A. Navia, J. Worth, R. P. Johnson, & B. D. Walker. Human immunodeficiency virus type 1-specific cytotoxic T lymphocytes release gamma interferon, tumor necrosis factor alpha (TNF-alpha), and TNF-beta when they encounter their target antigens. *J Virol* **67**:2844–2852, 1993.

NOTE: (Medline: 93233253) In this study the ability of HIV-1-specific CTL clones derived from seropositive persons to release gamma interferon (IFN- γ), tumor necrosis factor alpha (TNF- α), and TNF- β upon contact with target cells presenting viral antigen was assessed. Epitopes: p17: KIRLRPGGKKYKLKHIVWASRELE, A3; gp41: VERYLKDQQL, B14 and A28; ERYLKDQQL, B14; RT: AIFQSSMTK-ILEPFRKQNPDIVIYQ, A11; and nef SQRRQDILDLWIYHTQGYFPDWQNY, B13.

[Jassoy (1992)] C. Jassoy, R. P. Johnson, B. A. Navia, J. Worth, & B. D. Walker. Detection of a vigorous HIV-1 specific cytotoxic T lymphocyte response in cerebrospinal fluid from infected persons with AIDS dementia complex. *J. Immunol* **149**:3113–3119, 1992.

previously characterized TAP-1 and TAP-2 dependent pathway can generate all env epitopes and uses env protein mislocalized in the cytosol to produce peptides. The second, novel pathway uses a TAP-1/2 independent pathway, and allows a subset of MHC restricted epitopes to be processed in the endoplasmic reticulum or a premedial Golgi compartment.

[Hammond (1991)] S. A. Hammond, E. Obah, P. Stanhope, C. R. Monell, M. Strand, F. M. Robbins, W. B. Bias, R. W. Karr, S. Koenig, & R. F. Siliciano. Characterization of a conserved T-cell epitope in HIV-1 gp41 recognized by vaccine-induced human cytolytic T-cells. *J Immunol* **146**:1470–1477, 1991.

NOTE: (Medline: 91132009) A HLA DPw4.2 human CTL epitope located in gp41 was described, recognized by CD4+ CTL clones that were induced in seronegative humans by immunization with recombinant gp160 BRU. gp41 CTL epitope: GIKQLQARILAVERYLKDQ.

[Hickling (1990)] J. K. Hickling, C. M. Fenton, K. Howland, S. G. Marsh, & J. B. Rothbard. Peptides recognized by class I restricted T-cells also bind to MHC class II molecules. *International Immunology* **2**:435–441, 1990.

NOTE: (Medline: 91197875) Peptides shown to be presented in the context of MHC class I proteins by mouse or human CD8+ T lymphocytes could also bind to HLA-DR molecules on the surface of B lymphoblastoid cell lines (B-LCL). Four out of five class I restricted T cell determinants bound, including the HIV-1 gp120 epitope.

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[Hosmalin (1990)] A. Hosmalin, M. Clerici, R. Houghten, C. D. Pendleton, C. Flexner, D. R. Lucey, B. Moss, R. N. Germain, G. M. Shearer, & J. A. Berzofsky. An epitope in human immunodeficiency virus 1 reverse transcriptase recognized by both mouse and human cytotoxic T lymphocytes. *Proc. Natl. Acad. Sci. USA* **87**:2344–2348, 1990.

NOTE: (Medline: 90192804).

[Jardetzky (1991)] T. S. Jardetzky, W. S. Lane, R. A. Robinson, D. R. Madden, & D. C. Wiley. Characteristics of peptides eluted from HLA B7. *Nature* **353**:326–329, 1991.

NOTE: (Medline: 92018188).

[Jassoy (1993)] C. Jassoy, T. Harrer, T. Rosenthal, B. A. Navia, J. Worth, R. P. Johnson, & B. D. Walker. Human immunodeficiency virus type 1-specific cytotoxic T lymphocytes release gamma interferon, tumor necrosis factor alpha (TNF-alpha), and TNF-beta when they encounter their target antigens. *J Virol* **67**:2844–2852, 1993.

NOTE: (Medline: 93233253) In this study the ability of HIV-1-specific CTL clones derived from seropositive persons to release gamma interferon (IFN- γ), tumor necrosis factor alpha (TNF- α), and TNF- β upon contact with target cells presenting viral antigen was assessed. Epitopes: p17: KIRLRPGGKKKYKLKHIVWASRELE, A3; gp41: VERYLKDDQL, B14 and A28; ERYLKDDQL, B14; RT: AIFQSSMTK-ILEPFRKQNPDIVYQ, A11; and nef SQRRQDILDLWIYHTQGYFPDWQNY, B13.

[Jassoy (1992)] C. Jassoy, R. P. Johnson, B. A. Navia, J. Worth, & B. D. Walker. Detection of a vigorous HIV-1 specific cytotoxic T lymphocyte response in cerebrospinal fluid from infected persons with AIDS dementia complex. *J. Immunol* **149**:3113–3119, 1992.

NOTE: (Medline: 93017933) CTL clones derived from CSF of individuals with AIDS dementia. HIV-1 specific CTL were detected in CSF from 5 out of 6 patients who were suffering from HIV-1 associated cognitive/motor complex disturbances.

[Johnson (1994a)] R. P. Johnson, S. A. Hammond, A. Trocha, R. F. Siliciano, & B. D. Walker. Epitope specificity of MHC restricted cytotoxic T lymphocytes induced by candidate HIV-1 vaccine. *AIDS Research and Human Retroviruses* **189**:35–63, 1994a.

NOTE: (Medline: 95169519) Volunteers were immunized with recombinant vaccinia virus expressing HIV-1 gp160 (vac-env) and boosted with recombinant gp160 (rgp160). CTL clones were analyzed for HLA restriction and specificity. An immunodominant HLA-A3.1 restricted epitope was observed that showed very little sequence variation among B subtype sequences, (TVYYGVPWK). Naturally occurring variants of this peptide were able to stimulate reactivity. Two additional CD8+ CTL epitopes from vaccinees were characterized, as well as two CD4+ CTL epitopes.

[Johnson (1994b)] R. P. Johnson, S. A. Hammond, A. Trocha, R. F. Siliciano, & B. D. Walker. Induction of a major histocompatibility complex class I-restricted cytotoxic T-lymphocyte response to a highly conserved region of human immunodeficiency virus type 1 (HIV-1) gp120 in seronegative humans immunized with a candidate HIV-1 vaccine. *J Virol* **68**:3145–3153, 1994b.

NOTE: (Medline: 94202302) In two volunteers, immunization with a single strain of HIV-1 induced CD4+ and CD8+ CTL that are specific for multiple conserved regions of HIV-1 and would be expected to recognize a broad range of viral isolates. The immunodominant gp120 epitope, gp120 TVYYGVPWK, elicited CD8+ HLA-A3.1 restricted CTL, and this epitope is highly conserved. CTL specific for this epitope could lyse target cells sensitized with all known natural sequence variants. Additionally, CD8+ HLA-B35 and CD8+ HLA-B18 restricted epitopes were defined as well as two CD4+ cytotoxic T-cell gp120 epitopes: ITQACPKVSFEPIPHYPAGFAI and NNTLKQIDSKLREQFG.

[Johnson (1992)] R. P. Johnson, A. Trocha, T. M. Buchanan, & B. D. Walker. Identification of overlapping HLA class I-restricted cytotoxic T-cell epitopes in a conserved region of the human immunodeficiency virus type 1 envelope glycoprotein: definition of minimum epitopes and analysis of the effects of sequence variation. *J Exp Med* **175**:961–971, 1992.

NOTE: (Medline: 92202878) Fine mapping and mutational analysis of gp41 epitopes: ERYLKDQQL, HLA B14 and YLKDQQLL, HLA B8.

[Johnson (1993)] R. P. Johnson, A. Trocha, T. M. Buchanan, & B. D. Walker. Recognition of a highly conserved region of human immunodeficiency virus type 1 gp120 by an HLA-Cw4-restricted cytotoxic T-lymphocyte clone. *J Virol* **67**:438–445, 1993.

NOTE: (Medline: 93100827) The epitope sequence FNCGGEFF stimulates CTL response; the natural variants FNCRGEFF (SF2), TNCRGEFL (ROD) and LNCGGEFF (NDK) do not serve as epitopes. This was the first report of an HIV antigen specific target cells restricted by an HLA-C molecule, Cw4.

[Johnson (1991)] R. P. Johnson, A. Trocha, L. Yang, G. P. Mazzara, D. L. Panicali, T. M. Buchanan, & B. D. Walker. HIV-1 gag-specific cytotoxic T lymphocytes recognize multiple highly conserved epitopes. fine specificity of the gag-specific response defined by using unstimulated peripheral blood mononuclear cells and cloned effector cells. *J Immunol* **147**:1512–1521, 1991.

NOTE: (Medline: 91349569) This study presented a detailed study of gag specific CTL from HIV-1 seropositive individuals. Seven p24 and two p17 epitopes were described, that were recognized by class I restricted CD3+CD8+ CTL. p17 epitopes: KIRLRPGGKKKYKLKHIVWAS-

NOTE: (Medline: 93017933) CTL clones derived from CSF of individuals with AIDS dementia. HIV-1 specific CTL were detected in CSF from 5 out of 6 patients who were suffering from HIV-1 associated cognitive/motor complex disturbances.

[Johnson (1994a)] R. P. Johnson, S. A. Hammond, A. Trocha, R. F. Siliciano, & B. D. Walker. Epitope specificity of MHC restricted cytotoxic T lymphocytes induced by candidate HIV-1 vaccine. *AIDS Research and Human Retroviruses* **189**:35–63, 1994a.

NOTE: (Medline: 95169519) Volunteers were immunized with recombinant vaccinia virus expressing HIV-1 gp160 (vac-env) and boosted with recombinant gp160 (rgp160). CTL clones were analyzed for HLA restriction and specificity. An immunodominant HLA-A3.1 restricted epitope was observed that showed very little sequence variation among B subtype sequences, (TVYYGVPVWK). Naturally occurring variants of this peptide were able to stimulate reactivity. Two additional CD8+ CTL epitopes from vaccinees were characterized, as well as two CD4+ CTL epitopes.

[Johnson (1994b)] R. P. Johnson, S. A. Hammond, A. Trocha, R. F. Siliciano, & B. D. Walker. Induction of a major histocompatibility complex class I-restricted cytotoxic T-lymphocyte response to a highly conserved region of human immunodeficiency virus type 1 (HIV-1) gp120 in seronegative humans immunized with a candidate HIV-1 vaccine. *J Virol* **68**:3145–3153, 1994b.

NOTE: (Medline: 94202302) In two volunteers, immunization with a single strain of HIV-1 induced CD4+ and CD8+ CTL that are specific for multiple conserved regions of HIV-1 and would be expected to recognize a broad range of viral isolates. The immunodominant gp120 epitope, gp120 TVYYGVPVWK, elicited CD8+ HLA-A3.1 restricted CTL, and this epitope is highly conserved. CTL specific for this epitope could lyse target cells sensitized with all known natural sequence variants. Additionally, CD8+ HLA-B35 and CD8+ HLA-B18 restricted epitopes were defined as well as two CD4+ cytotoxic T-cell gp120 epitopes: ITQACPKVSFEPHIPHYCAPAGFAI and NNTLKQIDSKLREQFG.

[Johnson (1992)] R. P. Johnson, A. Trocha, T. M. Buchanan, & B. D. Walker. Identification of overlapping HLA class I-restricted cytotoxic T-cell epitopes in a conserved region of the human immunodeficiency virus type 1 envelope glycoprotein: definition of minimum epitopes and analysis of the effects of sequence variation. *J Exp Med* **175**:961–971, 1992.

NOTE: (Medline: 92202878) Fine mapping and mutational analysis of gp41 epitopes: ERYLKDQQL, HLA B14 and YLKDQQLL, HLA B8.

[Johnson (1993)] R. P. Johnson, A. Trocha, T. M. Buchanan, & B. D. Walker. Recognition of a highly conserved region of human immunodeficiency virus type 1 gp120 by an HLA-Cw4-restricted cytotoxic T-lymphocyte clone. *J Virol* **67**:438–445, 1993.

NOTE: (Medline: 93100827) The epitope sequence FNCGGEFF stimulates CTL response; the natural variants FNCRGEFF (SF2), TNCRGEFL (ROD) and LNCGGEFF (NDK) do not serve as epitopes. This was the first report of an HIV antigen specific target cells restricted by an HLA-C molecule, Cw4.

[Johnson (1991)] R. P. Johnson, A. Trocha, L. Yang, G. P. Mazzara, D. L. Panicali, T. M. Buchanan, & B. D. Walker. HIV-1 gag-specific cytotoxic T lymphocytes recognize multiple highly conserved epitopes. fine specificity of the gag-specific response defined by using unstimulated peripheral blood mononuclear cells and cloned effector cells. *J Immunol* **147**:1512–1521, 1991.

NOTE: (Medline: 91349569) This study presented a detailed study of gag specific CTL from HIV-1 seropositive individuals. Seven p24 and two p17 epitopes were described, that were recognized by class I restricted CD3+CD8+ CTL. p17 epitopes: KIRLRPGGKKKYKLKHIVWAS-

RELE and QTGSEELRSLYNTVATLYCVHQRIE; p24 epitopes: NPPIPVGEIYKRWIILGLNKIV, VHQAISPRTLNAWVKVVEEKAF, NAWVKVVEEKAFSPEVPMFSA, SALSEGATPQDLNMLNTVGGH, GHQAAMQMLKETINEAAEWDR, and RAEQASQEVK.

[Johnson & Walker(1994)] R. P. Johnson & B. D. Walker. CTL in HIV-1 infection: Responses to structural proteins. *Curr Topics Microbiol Immunol* **189**:35–63, 1994.

NOTE: (Medline: 95008926) review.

[Kalams (1994)] S. Kalams, R. P. Johnson, A. K. Trocha, M. J. Dynan, H. S. Ngo, R. T. D'Aquila, J. T. Kurnick, & B. D. Walker. Longitudinal analysis of T-cell receptor (TCR) gene usage by HIV-1 envelope-specific cytotoxic T-lymphocyte clones reveals a limited TCR repertoire. *J. Exp. Med.* **179**:1261–1271, 1994.

NOTE: (Medline: 94194282) This paper presents an in depth longitudinal study of T-cell receptor gene usage to a well defined HLA B14 restricted gp41 epitope. Ten CTL clones were derived from a single individual over 31 months. T-cell receptor V-D-J sequencing was performed on PCR amplification products. All ten clones utilized $\text{V}\alpha 14$ and $\text{V}\beta 4$ genes; observed limited T-cell receptor diversity to an immunodominant epitope was suggested to facilitate immune escape. gp41 epitope: ERYLKDQQL. An HLA B14 restricted RT epitope from this individual used $\text{V}\alpha 21$ and $\text{V}\beta 14$, showing use of these genes was not a feature of all HLA B14 restricted clones from this individual. RT epitope: AIYLALQDSGLEVNVITDSQYALGI.

[Kast (1994)] W. M. Kast, R. M. Brandt, J. Sidney, J. W. Drijfhout, R. T. Kubo, H. M. Grey, C. J. Mielke, & A. Sette. Role of HLA-A motifs in identification of potential CTL epitopes in human papillomavirus type 16 E6 and E7 proteins. *J Immunol* **152**:3904–3912, 1994.

NOTE: (Medline: 94194153) Binding affinities for five HLA-A alleles: HLA-A1 (A^*0101), A2.1 (A^*0201), A3 (A^*0301), A11 (A^*1101), and A24 (A^*2401) was determined for all nonamer peptides of human papillomavirus type 16 E6 and E7. High affinity binding peptides allowed an assessment of binding-motifs.

[Klenerman (1994)] P. Klenerman, S. Rowland-Jones, S. McAdam, J. Edwards, S. Daenke, D. Laloo, B. Koppe, W. Rosenberg, D. Boyd, A. Edwards, P. Giangrande, R. E. Phillips, & A. J. McMichaels. Cytotoxic T-cell activity antagonized by naturally occurring HIV-1 Gag variants. *Nature* **369**:403–407, 1994.

NOTE:(Medline: 94255016) These paper documents that naturally occurring peptide variants can serve as antagonists, that is they can inhibit normal lysis of cells presenting the original epitope. The variants studied could serve as antagonists when they were processed from recombinant vaccinia, replicated HIV, or when they were synthetic peptides. Both agonist and antagonist sequences were found in the study subjects from whom the CTL clones were derived.

[Koenig (1990)] S. Koenig, T. R. Fuerst, L. V. Wood, R. M. Woods, J. A. Suzich, G. M. Jones, V. F. de la Cruz, R. T. Davey Jr., S. Venkatesan, B. Moss, W. E. Biddison, & A. S. Fauci. Mapping the fine specificity of a cytotoxic T-cell response to HIV-1 nef protein. *J Immunol* **145**:127–135, 1990.

NOTE: (Medline: 90293448) A 10 residue peptide that triggers CTL in association with the HLA A3.1 molecule was studied. Human cell transfectants were used to map a critical residue in the HLA A3.1 molecule for recognition, amino acid 152, which is present on the alpha-2 helix in HLA-A3.1 and is modified in the HLA A3.2 A3 allele.

[Layton (1993)] G. T. Layton, S. J. Harris, A. J. Gearing, M. Hill-Perkins, J. S. Cole, J. C. Griffiths, N. R. Burns, A. J. Kingsman, & S. E. Adams. Induction of HIV-specific cytotoxic T lymphocytes in vivo with hybrid HIV-1 V3:Ty-virus-like particles. *J Immunol* **151**:1097–1107, 1993.

NOTE: (Medline: 95271010) V3-Ty-Virus-like particles can induce type specific CTL in mice in the absense of adjuvant.

[Lieberman (1992)] J. Lieberman, J. A. Fabry, M. Kuo, P. Earl, B. Moss, & P. R. Skolnik. Cytotoxic T lymphocytes from HIV-1 seropositive individuals recognize immunodominant epitopes in gp160 and reverse transcriptase. *J Immunol* **148**:2738–2747, 1992.

NOTE: (Medline: 92242898) This paper does not use T-cell clones to map epitopes, but rather T-cell lines from HIV infected donors. 20 amino acid peptides were used of map the region of the reactive epitopes. HLA restriction was not tested for all epitopes.

[Littaua (1991)] R. A. Littaua, M. B. A. Oldstone, A. Takeda, C. Debouck, J. T. Wong, C. U. Tuazon, B. Moss, F. Kievits, & F. A. Ennis. An HLA-C-Restricted CD8+ cytotoxic T-Lymphocyte clone recognizes a highly conserved epitope on human immunodeficiency virus type 1 gag. *J Virol* **65**:4051–4056, 1991.

NOTE: (Medline: 91303653) Fine mapping of gag p24 epitope with HLA-C restriction: QAIISPR, HLA, Cw3.

[Macatonia (1991)] S. E. Macatonia, S. Patterson, & S. C. Knight. Primary proliferative and cytotoxic T-cell responses to HIV induced in vitro by human dendritic cells. *Immunology* **74**(3):399–406, 1991.

NOTE: (Medline: 92120708) A primary CTL response in cells from uninfected donors was detected by using a system where peptide was presented by human dendritic cells.

[McMichael & Walker(1994)] A. J. McMichael & B. D. Walker. Cytotoxic T lymphocytes epitopes: implications for HIV vaccine. *AIDS* **8**S:S155–S173, 1994.

NOTE: Comprehensive review summarizing CTL epitopes that have known HLA type and are fine mapped to indicate epitope boundaries. Anchor residues are indicated when known for different HLA restricted epitopes. Includes a summary of the published literature, as well as much work that was in press or submitted for publication.

[Meyerhans (1991)] A. Meyerhans, G. Dadaglio, J. P. Vartanian, P. Langlade-Demoyen, R. Frank, B. Asjo, F. Plata, & S. Wain-Hobson. *In vivo* persistence of a HIV-1-encoded HLA-B27-restricted cytotoxic T lymphocyte epitope despite specific *in vitro* reactivity. *Eur J Immunol* **21**:2637–2640, 1991.

NOTE: (Medline: 92008181) This study looked for the presence of CTL escape mutants *in vivo* in proviral DNA from an infected individual who had CTL activity; in 8 and 14 months escape mutants had not accumulated.

[Nixon & McMichael(1988)] D. Nixon & A. J. McMichael. Cytotoxic T-cell recognition of HIV proteins and peptides. *AIDS* **5**:1049–1059, 1988.

[Nixon (1988)] D. Nixon, A. Townsend, J. Elvin, C. Rizza, J. Gallway, & A. McMichael. HIV-1 gag-specific cytotoxic T lymphocytes defined with recombinant vaccinia virus and synthetic peptides. *Nature* **336**:484–487, 1988.

NOTE: (Medline: 89057146) p24 KRWIILGLNKIVRMY.

[Nixon (1990)] D. F. Nixon, S. Huet, J. Rothbard, M. Kieny, M. Delchambre, C. Thiriart, C. R. Rizza, F. M. Gotch, & A. J. McMichael. An HIV-1 and HIV-2 cross-reactive cytotoxic T-cell epitope. *AIDS* **4**:841–845, 1990.

NOTE: (Medline: 91069449) A HLA-B27 specific CTL clone from an HIV-1 infected individual that reacts with the Gag SF2 epitope KRWIILGLNKIVRMY also cross-reacts with the HIV-2 ROD analog RRWIQIGLQKSVRMY. The CTL also reacts with HIV-1 ELI KR-WIIVGLNKIVRMY and SIVmm142 RRWIQLGLQKSVRMY, but only at very high concentration of peptide with SIVk6w78 RRWIQLRLQKSVRMY. The binding of the SIVk6w78 peptide to HLA-B27 does not seem to be reduced, so the authors suggest that the reduced ability to stimulate is in this case due to T-cell receptor interaction.

[Nixon & McMichael(1991)] D. F. Nixon & A. J. McMichael. Cytotoxic T-cell recognition of HIV proteins and peptides. *AIDS* **5**:1049, 1991.

NOTE: (Medline: 92029720) p17: LRPGGKKKYKLKHIV, HLA B8 and p24: VQNANPDCKTILKAL, HLA B8.

[Nowak (1995)] M. A. Nowak, R. M. May, R. E. Phillips, S. Rowland-Jones, D. G. Laloo, S. McAdam, P. Klenerman, B. Koppe, K. Sigmund, C. R. M. Bangham, & A. J. McMichael. Antigenic oscillations and shifting immunodominance in HIV-1 infections. *Nature* **375**:606–611, 1995.

NOTE: (Medline: 95312083) This paper presents longitudinal studies of epitope variation and corresponding CTL responses in two patients. A mathematical model was created to provide a framework to explain the observed shifts in epitope and CTLp frequencies. For discussion, see also: J. M. Coffin, *Nature* **375**:534-535 (1995).

[Parker (1994)] K. C. Parker, M. A. Bednarek, & J. E. Coligan. Scheme for ranking potential HLA-A2 binding peptides based on independent binding of individual peptide side-chains. *J Immunol* **152**, 1994.

NOTE: (Medline: 94075819) The authors conclude that peptide amino acid side-chain binding to the HLA-A2 molecule is independent of the sequence of the peptide, and developed a table of coefficients that can be used to help predict peptide binding to HLA-A2.

[Parker (1992)] K. C. Parker, M. A. Bednarek, L. K. Hull, U. Utz, B. C. H. J. Zweerink, W. E. Biddison, & J. E. Coligan. Sequence motifs important for peptide binding to the human MHC class I molecule, HLA-A2. *J Immunol* **149**, 1992.

NOTE: (Medline: 93056532).

[Phillips (1991)] R. E. Phillips, S. Rowland-Jones, D. F. Nixon, F. M. Gotch, J. P. Edwards, A. O. Ogunlesi, J. G. Elvin, J. A. Rothbard, C. R. Bangham, C. R. Rizza, & A. J. McMichael. Human immunodeficiency virus genetic variation that can escape cytotoxic T-cell recognition. *Nature* **354**:453–459, 1991.

NOTE: (Medline: 92086044) Fluctuations in the specificity of cytotoxic T-cells for HIV was correlated with variability in proviral gag (DNA) epitope sequences.

[Price (1995)] P. Price, R. P. Johnson, D. T. Scadden, C. Jassoy, T. Rosenthal, S. Kalams, & B. D. Walker. Cytotoxic CD8+ T lymphocytes reactive with human immunodeficiency virus-1 produce granulocyte/macrophage colony-stimulating factor and variable amounts of interleukins 2, 3, and 4 following stimulation with the cognate epitope. *Clinical Immunology and Immunopathology* **74**:100–106, 1995.

NOTE: (Medline: 95087232) Cyotkine release from stimulated CTL clones derived from either the peripheral blood or CSF of 3 patients was

studied. HLA restriction was determined for two of seven clones. GM-CSF and TNF- α and IFN- γ were produced by all clones; most clones produced low amounts of IL-2, IL-3, and IL-4.

[Rammensee (1995)] H.-G. Rammensee, T. Friede, & S. Stevanovic. Mhc ligands and peptide motifs: first listing. *Immunogenetics* **41**:178–228, 1995.

NOTE: (Medline: 95197186).

[Robertson (1993)] M. N. Robertson, F. Buseyne, O. Schwartz, & Y. Riviere. Efficient antigen presentation to cytotoxic T lymphocytes by cells transduced with a retroviral vector expressing the HIV-1 Nef protein. *AIDS Res and Human Retroviruses* **9**:1217–1223, 1993.

NOTE: (Medline: 94190626) This paper presents a retroviral vector system for antigen presentation to CTLs. As part of the controls to test their system, they study the response to specific nef peptides, which contain the dominant CTL epitopes in nef in their study subject.

[Rowland-Jones (1993)] S. L. Rowland-Jones, S. H. Powis, J. Sutton, I. Mockridge, F. M. Gotch, N. Murray, A. B. Hill, W. M. Rosenberg, J. Trowsdale, & A. J. McMichael. An antigen processing polymorphism revealed by HLA-B8-restricted cytotoxic T lymphocytes which does not correlate with TAP gene polymorphism. *Eur J Immunol* **23**:1999–2004, 1993.

NOTE: (Medline: 93345604) Individual fails to present HLA-B8-restricted influenza epitope, but can present an HLA-B8-restricted HIV-1 gag epitope.

[Rowland-Jones (1995)] S. L. Rowland-Jones, J. Sutton, K. Ariyoshi, T. Dong, , F. Gotch, S. McAdam, D. Whitby, S. Sabally, A. Gallimore, T. Corrah, M. Takiguchi, T. Schultz, A. McMichael, & H. Whittle. HIV-specific cytotoxic T-cells in HIV-exposed but uninfected Gambian women. *Nature Medicine* **1**:59–64, 1995.

NOTE: Four HIV-1 and -2 cross-reactive epitopes that are presented to CTL from HIV-infected Gambians by HLA-35 were identified. These peptides could elicit HIV specific CTLs from 3 of 6 repeatedly exposed but seronegative sex workers who carry the HLA-B35 allele. Most CTL derived from HIV-2 positive donors also recognized the HIV-2 peptide and the analogous HIV-1 peptide.

[Safrit (1994a)] J. T. Safrit, C. A. Andrews, T. Zhu, D. D. Ho, & R. A. Koup. Characterization of human immunodeficiency virus type 1-specific cytotoxic Tlymphocyte clones isolated during acute seroconversion: recognition of autologous virus sequences within a conserved immunodominant epitope. *J Exp Med* **179**:463–472, 1994a.

NOTE: (Medline: 94125027) HIV-1 specific CTL clones were isolated from two individuals at acute seroconversion. In one patient, two HLA A31-restricted clones recognized the same fragment of gp41, peptide RLRDLLLIVTR, but one was sensitive to a Thr to Val substitution, while the other was not. A CTL HLA A32-restricted clone from the other patient recognized the gp41 peptide VLSIVNRVRQGYSPLSFQTH. Autologous viral sequences from seroconversion were recognized by the CTL clones, but not the HIV-1 strain MN.

[Safrit (1994b)] J. T. Safrit, A. Y. Lee, C. A. Andrews, & R. A. Koup. A region of the third variable loop of HIV-1 gp120 is recognized by HLA-B7-Restricted CTLs from two acute seroconversion patients. *J Immunol* **153**:3822–3830, 1994b.

NOTE: (Medline: 95015873) HIV-1 envelope-specific CTL clones were isolated from the peripheral blood of two patients from within weeks of seroconversion. These clones were CD8+ and restricted by the HLA-B7 molecule. The minimum epitope was defined, RPNNNNTRKSI, with

anchor residues at the proline and isoleucine; the anchor residues are relatively well conserved. A serine to arginine change at position 9 of the epitope abrogated clone recognition in one of the patients. This aa change is one factor that has been associated with a change from a nonsyncytium-inducing to a syncytium-inducing phenotype of HIV-1.

[Shirai (1992)] M. Shirai, C. D. Pendleton, & J. A. Berzofsky. Broad recognition of cytotoxic T cell epitopes from the HIV-1 envelope protein with multiple class I histocompatibility molecules. *J Immunol* **148**:1657–1667, 1992.

NOTE: (Medline: 92176620) This paper explored the possibility that defined epitopes from HIV-1 env might be presented by multiple class I genes to CTLs using a murine system, isolating CTL from mice immunized with gp160 expressing recombinant vaccinia virus. The CTL epitope at the tip of the V3 loop (P18) was found to be presented by class I MHC molecules from four of ten haplotypes tested. Peptides that had previously been defined as helper T cell determinants (T1 in gp120, and HP53 (also called TH4.3)) were also able to stimulate CTL from mice with multiple haplotypes.

[Siliciano (1988)] R. Siliciano, T. Lawton, C. Knall, R. Karr, P. Berman, T. Gregory, & E. Reinherz. Analysis of host-virus interactions in AIDS with anti-gp120 T-cell clones: Effect of HIV sequence variation and a mechanism for CD4+ cell depletion. *Cell* **54**:561–575, 1988.

NOTE: (Medline: 88295131) This article demonstrated that a class II HLA-DR4 restricted response can be stimulated by CD4 uptake of gp120, suggesting a mechanism for T-cell depletion in vivo. This peptide containing the epitope was also able to stimulate a class I restricted, CD8+ CTL response.

[Sutton (1993)] J. Sutton, S. Rowland-Jones, W. Rosenberg, D. Nixon, F. Gotch, X. Gao, N. Murray, A. Spoonas, P. Driscoll, M. Smith, A. Willis, & A. McMichael. A sequence pattern for peptides presented to cytotoxic T lymphocytes by HLA B8 revealed by analysis of epitopes and eluted peptides. *Eur J Immunol* **23**:447–453, 1993.

NOTE: (Medline: 93170395).

[Takahashi (1988)] H. Takahashi, J. Cohen, A. Hosmalin, K. B. Cease, R. Houghten, J. L. Cornette, C. DeLisi, B. Moss, R. N. Germain, & J. A. Berzofsky. An immunodominant epitope of the human immunodeficiency virus envelope glycoprotein gp160 recognized by class I major histocompatibility complex molecule-restricted murine cytotoxic T lymphocytes. *Proc Natl Acad Sci USA* **85**:3105–3109, 1988.

NOTE: (Medline: 88203649) Mice were infected with a recombinant vaccinia virus expressing the HIV gp160 envelope gene, and the primed lymphocytes were restimulated *in vitro* with a transfected histocompatible cell line expressing the same gene. H-2^d mice respond predominantly to a single immunodominant site represented by a 15-residue synthetic peptide.

[Takahashi (1989a)] H. Takahashi, R. Houghten, S. D. Putney, D. H. Margulies, B. Moss, R. N. Germain, & J. A. Berzofsky. Structural requirements for class I MHC molecule-mediated antigen presentation and cytotoxic T-cell recognition of an immunodominant determinant of the human immunodeficiency virus envelope protein. *J Exp Med* **170**:2023–2035, 1989a.

NOTE: (Medline: 90063467) Murine BALBc CTL Class I D^d cells elicited by HIV-1 IIIB peptide: RIQRGPGRGAFVTIGK.

[Takahashi (1989b)] H. Takahashi, S. Meril, S. D. Putney, R. Houghten, B. Moss, R. N. Germain, & J. A. Berzofsky. A single amino acid interchange yields reciprocal CTL specificities for HIV-1 gp160. *Science* **246**:118–121, 1989b.

anchor residues at the proline and isoleucine; the anchor residues are relatively well conserved. A serine to arginine change at position 9 of the epitope abrogated clone recognition in one of the patients. This aa change is one factor that has been associated with a change from a nonsyncytium-inducing to a syncytium-inducing phenotype of HIV-1.

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NOTE: (Medline: 92176620) This paper explored the possibility that defined epitopes from HIV-1 env might be presented by multiple class I genes to CTLs using a murine system, isolating CTL from mice immunized with gp160 expressing recombinant vaccinia virus. The CTL epitope at the tip of the V3 loop (P18) was found to be presented by class I MHC molecules from four of ten haplotypes tested. Peptides that had previously been defined as helper T cell determinants (T1 in gp120, and HP53 (also called TH4.3)) were also able to stimulate CTL from mice with multiple haplotypes.

[Siliciano (1988)] R. Siliciano, T. Lawton, C. Knall, R. Karr, P. Berman, T. Gregory, & E. Reinherz. Analysis of host-virus interactions in AIDS with anti-gp120 T-cell clones: Effect of HIV sequence variation and a mechanism for CD4+ cell depletion. *Cell* **54**:561–575, 1988.

NOTE: (Medline: 88295131) This article demonstrated that a class II HLA-DR4 restricted response can be stimulated by CD4 uptake of gp120, suggesting a mechanism for T-cell depletion in vivo. This peptide containing the epitope was also able to stimulate a class I restricted, CD8+ CTL response.

[Sutton (1993)] J. Sutton, S. Rowland-Jones, W. Rosenberg, D. Nixon, F. Gotch, X. Gao, N. Murray, A. Spoonas, P. Driscoll, M. Smith, A. Willis, & A. McMichael. A sequence pattern for peptides presented to cytotoxic T lymphocytes by HLA B8 revealed by analysis of epitopes and eluted peptides. *Eur J Immunol* **23**:447–453, 1993.

NOTE: (Medline: 93170395).

[Takahashi (1988)] H. Takahashi, J. Cohen, A. Hosmalin, K. B. Cease, R. Houghten, J. L. Cornette, C. DeLisi, B. Moss, R. N. Germain, & J. A. Berzofsky. An immunodominant epitope of the human immunodeficiency virus envelope glycoprotein gp160 recognized by class I major histocompatibility complex molecule-restricted murine cytotoxic T lymphocytes. *Proc Natl Acad Sci USA* **85**:3105–3109, 1988.

NOTE: (Medline: 88203649) Mice were infected with a recombinant vaccinia virus expressing the HIV gp160 envelope gene, and the primed lymphocytes were restimulated *in vitro* with a transfected histocompatible cell line expressing the same gene. H-2^d mice respond predominantly to a single immunodominant site represented by a 15-residue synthetic peptide.

[Takahashi (1989a)] H. Takahashi, R. Houghten, S. D. Putney, D. H. Margulies, B. Moss, R. N. Germain, & J. A. Berzofsky. Structural requirements for class I MHC molecule-mediated antigen presentation and cytotoxic T-cell recognition of an immunodominant determinant of the human immunodeficiency virus envelope protein. *J Exp Med* **170**:2023–2035, 1989a.

NOTE: (Medline: 90063467) Murine BALBc CTL Class I D^d cells elicited by HIV-1 IIIB peptide: RIQRGPGRAFVTIGK.

[Takahashi (1989b)] H. Takahashi, S. Meril, S. D. Putney, R. Houghten, B. Moss, R. N. Germain, & J. A. Berzofsky. A single amino acid interchange yields reciprocal CTL specificities for HIV-1 gp160. *Science* **246**:118–121, 1989b.

NOTE: (Medline: 89388278) Murine BALBc CTL Class I D^d epitope elicited by HIV-1 IIIB and MN gp160 vaccinia construct, stimulated with peptides: RIQRGPGRAFVTIGK, IIIB and RIHIGPGRAYTTKN, MN. These two peptides were non-cross reactive. Val/Tyr exchange was sufficient to interchange the specificities of the two peptides.

[Takahashi (1992)] H. Takahashi, Y. Nakagawa, C. D. Pendleton, R. Houghten, K. Yokomuro, R. N. Germain, & J. A. Berzofsky. Induction of broadly cross-reactive cytotoxic T-cells recognizing and HIV-1 envelope determinant. *Science* **255**:333–336, 1992.

NOTE: (Medline: 92196580) Murine BALBc CTL Class I epitope elicited by HIV-1 RF, IIIB and MN gp160 vaccinia construct, stimulated with peptides: SITKGPGRVIYATGQ, RF; RIQRGPGRAFVTIGK, IIIB; and RIHIGPGRAYTTKN, MN.

[Takahashi (1991)] K. Takahashi, L. Dai, T. R. Fuerst, W. E. Biddison, P. L. Earl, B. Moss, & F. A. Ennis. Specific lysis of human immunodeficiency virus type 1-infected cells by a HLA-A3.1-restricted CD8+ cytotoxic T-lymphocyte clone that recognizes a conserved peptide sequence within the gp41 subunit of the envelope protein. *Proc Natl Acad Sci USA* **88**:10277–10281, 1991.

NOTE: (Medline: 92052253) gp41 epitope: RLRDLLLIVTR, HLA A3.1 (NL43). Synthetic peptides of RF and CDC4 were recognized by CTL clone despite non-conservative Thr to (Val or Ala) change, but an MN peptide with four natural substitutions was not recognized.

[Tsomides (1994)] T. J. Tsomides, A. Aldovini, R. P. Johnson, B. D. Walker, R. A. Young, & H. N. Eisen. Naturally processed viral peptides recognized by cytotoxic T lymphocytes on cells chronically infected by human immunodeficiency virus type 1. *Journal of Experimental Medicine* **180**:1283–1293, 1994.

NOTE: (Medline: 95016420) Naturally processed peptides can be purified from trifluoroacetic acid lysates of HIV-1 infected cells. A gag and RT epitope were compared; both synthetic peptides are optimally active in CTL assays. The naturally processed gag peptide was more abundant than the RT peptide in HIV-1 infected HLA-A2 positive cells, and the gag specific CTL more effective, suggesting surface density of peptides may influence efficiency of CTL killing.

[Tsomides (1991)] T. J. Tsomides, B. D. Walker, & H. N. Eisen. An optimal viral peptide recognized by CD8+ T-cells binds very tightly to the restricting class I major histocompatibility complex protein on intact cells but not to the purified class I protein. *Proc Natl Acad Sci USA* **88**:11276–11280, 1991.

NOTE: (Medline: 92107932).

[van Baalen (1993)] C. A. van Baalen, M. R. Klein, A. M. Geretti, R. I. P. M. Keet, F. Miedema, C. A. C. M. van Els, & A. D. M. E. Osterhaus. Selective *in vitro* expansion of HLA class I-restricted HIV-1 Gag-specific CD8+ T-cells: cytotoxic T-lymphocyte epitopes and precursor frequencies. *AIDS* **7**:781–786, 1993.

NOTE: (Medline: 93371704) Gag specific epitopes and precursor frequencies were studied in seven individuals; for CTLs from one individual, fine mapping was done using peptides. PFA-fixed rVV-Gag-infected B-LCL cells were used as stimulator cells of bulk PBMC cultures to determine precursor frequencies and identify epitopes.

[Walker (1989)] B. D. Walker, C. Flexner, K. Birch-Limberger, L. Fisher, T. J. Paradis, A. Aldovini, R. Young, B. Moss, & R. T. Schooley. Long-term culture and fine specificity of human cytotoxic T-lymphocyte clones reactive with human immunodeficiency virus type 1. *Proc Natl*

Acad Sci USA **86**:9514–9518, 1989.

NOTE: (Medline: 90083298) Seven HIV-1 reverse transcriptase-specific cytotoxic T-lymphocyte (CTL) clones from the peripheral blood of two seropositive subjects were generated. Five different HLA restricted CTL epitopes were identified by peptide mapping.

[Zhang (1993)] Q. Zhang, R. Gavioli, G. Klein, & M. G. Masucci. An HLA-All-specific motif in nonamer peptides derived from viral and cellular proteins. *Proc Natl Acad Sci USA* **90**:2217–2221, 1993.

NOTE: (Medline: 93211933).